A31
Lib

THE JOURNAL

of

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

JUNE 1912

35 CENTS A COPY $3 A YEAR

PAPERS FOR THE NEXT ANNUAL MEETING SHOULD BE ON HAND SEPTEMBER 1

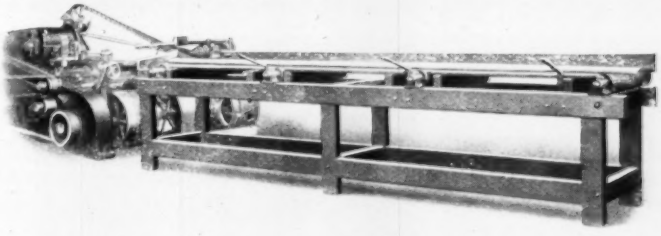
THE WARNER & SWASEY COMPANY

Works and Main Office: **Cleveland, U. S. A.**

Branch Offices: **New York, Boston, Chicago and Detroit**

Upwards of thirty years devoted to the manufacture of Machine Tools of the highest order—UNIVERSAL HOLLOW-HEXAGON TURRET LATHES, TURRET SCREW MACHINES AND BRASS-WORKING MACHINE TOOLS.

ANOTHER ACHIEVEMENT



WOODS AUTOMATIC FEEDING TABLE

Heretofore no feeder could feed lumber into a planer at 200 lineal feet per minute and keep the boards butting, but with this table any feeder can maintain a continuous feed varying from 200 to 300 feet.

This is an accessory of

"THE PLANERS OF WOODS"

S A WOODS MACHINE CO Boston U S A

CHICAGO NORFOLK SEATTLE NEW ORLEANS SAN FRANCISCO (by Mchy. Co.)

HARTNESS FLAT TURRET LATHE

Turret Description

THE turret is a flat circular plate; it is mounted on a low carriage containing controlling mechanism. The connections of the turret to the carriage, and the carriage to the lathe bed, are the most direct and rigid, affording absolute control of the cutting tools. The turret is accurately surfaced to its seat on the carriage by scraping, and securely held down on that seat by an annular gib. In the same manner the carriage is fitted to the Vs of the bed; the gibs pass under the outside edge of the bed.

The index pin is located directly under the working tool and so close to it that there can be no lost motion between the tool and the locking pin. The turret is turned automatically to each position the instant the tool clears the work on its backward travel, and it is so arranged that by raising and lowering trip screws near the center of the turret, it may be turned to three, four or five of the six places without making any other stops.

A simple, accurate stop mechanism for the turret slide provides twelve independently adjustable stops, two for each of the six positions of the turret, or any other division required by the operator.

The *feeding mechanism* for the turret slide and the cross-feeding head receives its power through a speed-varying device which is under the convenient control of the hand wheel at head end of bed. One revolution of this wheel gives the full range of feeds, from drilling feed of 120-per-inch to coarse turning feed of 10-per-inch, and every intermediate feed.

A spring torc weighing device on the feed rod gives the pulling power of this feed mechanism a known value. This device yields at a certain predetermined pressure.

In operation the carriage is fed forward until it reaches one of the stops, against which it is held by this pressure

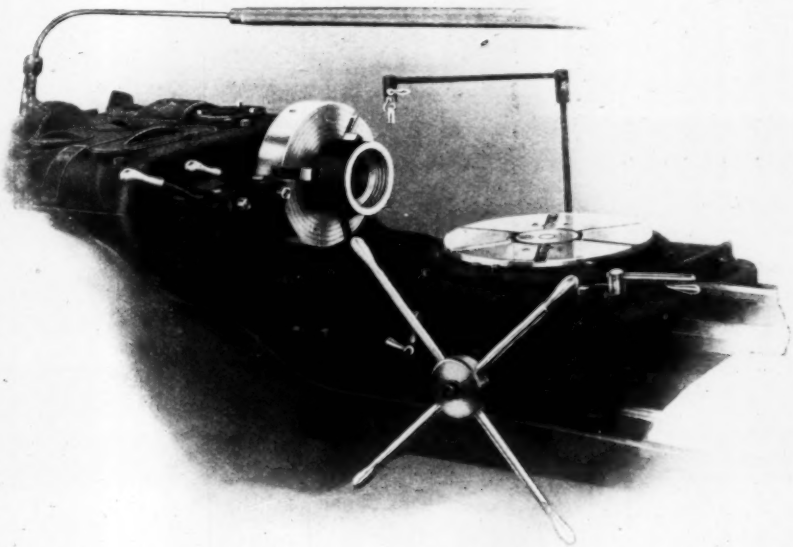
Springfield, Vt.
U. S. A.

Jones & Lamson

Germany, Holland, Belgium, Switzerland, Austria-Hungary,
M. Koyermann, Charlottenstrasse 112, Dusseldorf, Germany

till disengaged by the operator. Arresting the feed without releasing the carriage gives the tool a chance to accurately face the shoulder, leaving a smooth surface instead of the ragged face left when carriage is released under full cut.

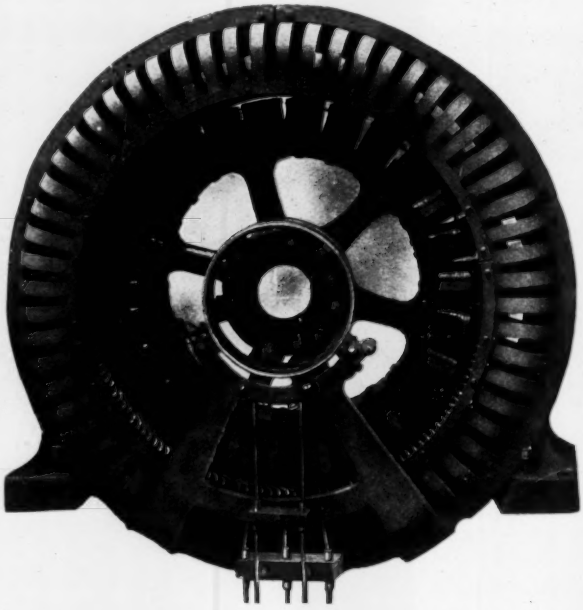
It has been the practice heretofore to arrange the positive stop a thirty-second of an inch beyond the knock-off for the feed, and in the usual operation of a machine of this kind the feed knocks off, and then the turret slide, released, jumps back, and the tool digs in, cutting a slight groove just back of the shoulder. When on work requiring exact shoulder distances or smoothly-finished shoulders, the operator brings the slide against the positive stop, holding it there with as nearly as possible uniform pressure until the turner has surely faced its full length. In the present machine the turret is always fed against the positive stop and held there with a uniform pressure, insuring the most accurate results for shoulder length.



Extracts from the book of the Hartness Flat Turret Lathe. Copies of the book mailed on request.

Machine Company Queen Victoria St. London, England.

France and Spain, Ph. Bonvillain and E. Ronceray, 9 and 11 Rue des Envierges, Paris Italy, Adler & Eisenchitz, Milan



Westinghouse Synchronous Motors

form the most satisfactory
and economical drive for

Compressors

Let us tell you why direct-connected Westinghouse self-starting synchronous motors form the ideal drive for compressors. Let us prove to you that the following statements are true:

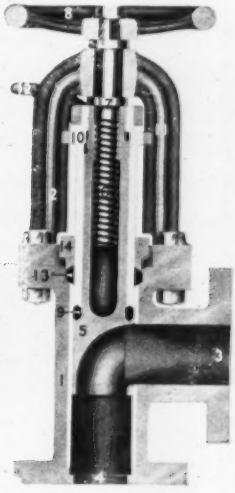
These motors cost least to install.
They save floor space.
Their efficiency is the highest.
Maintenance expense is minimum.
Transmission losses are eliminated.
First cost of these motors is about the same, and in large sizes less, than other types of motors.
They will actually reduce your power expense whether you make or purchase your power.

Write at once to Dept. 6 for complete information on Westinghouse Synchronous Motors and their advantages for use with compressors.

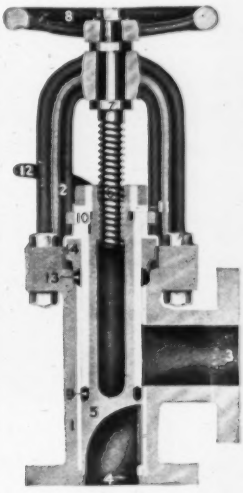
Westinghouse Electric & Manufacturing Co.

Sales Offices in 45 American Cities — East Pittsburgh, Pa.

(Outside view)



(Open)



(Closed)

NELSON Blow-off Valve

No seats. No discs.

Easy flow, as through a regular ell.

When wide open plunger strikes Collar (7).

When closed projection (4) limits travel.

Yoke is rigidly bolted to the body, with machined joints and drilled holes, always in accurate alignment, causing easy sliding operation of plunger.

Packing 13 is compressed by bolted gland 14; packing 9 is compressed by sleeve 10 by means of nut 11, which is turned by lever wrench 12.

Adjustment of either packing is *direct, independent*, takes only an instant and is required only occasionally.

Packing is especially adapted to its work and has very *long life*.

The opening is *slow*, allowing the pipe and fittings to heat gradually.

Keeps *clean*, no places for scale or dirt to collect.

Keeps *tight*, saves water and coal, no trouble.

Guaranteed. Catalogue on request. Correspondence invited.

Sizes 1½″ to 3″, Iron Body for 300 lbs. working pressure. Steel for extreme service. Also made in Straight-way type.

We make nothing but valves, but we make all sizes, for any pressure, for every purpose—Gates, Globes, Angles, Checks and Blow-offs. High grade valves exclusively. No competition stuff whatever.

Nelson Valve Company

Philadelphia

NEW YORK
30 Church St.

CHICAGO
7 West Kinzie St.

SAN FRANCISCO
22 Battery St.

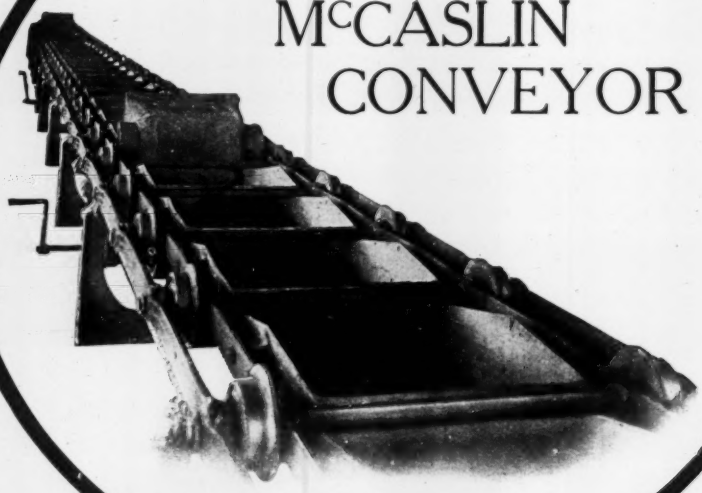
PITTSBURGH
517 Liberty Ave.

MINNEAPOLIS
622 Andrus Bldg.

BUTTE
56 E. Broadway

MONTREAL
12-14 University St.

THE McCASLIN CONVEYOR



MEAD-MORRISON
MANUFACTURING COMPANY

THE McCaslin Noiseless Overlapping Gravity Bucket Conveyor is the superior of any similar device offered to-day for the conveying of Coal, Ashes, Hot Clinker, etc., in Power Stations or Cement Mill Service. *Correspondence invited.*

WORKS AND GENERAL OFFICES

Cambridge, Mass.

New York	149 Broadway	Pittsburg,	108 Parkway, N. S.
Chicago	Monadnock Block	San Francisco	Metropolis Bank Bldg.
Baltimore,	821 Equitable Building	New Orleans -	110 North Peters St.
	Montreal	286 St. James St.	

Study the Advantages of this Short Belt Drive "Imperial"

It is a simple floating idler placed on a very short belt — **not a belt tightener**— giving the following advantages:

Gives greatest possible belt contact.

Initial strain on belt due to tension is relieved.

Eliminates excessive pressure on bearings.

Lengthens the life of the belt.

Minimizes slippage without increasing tension by increasing belt contact.

Affords a compact unit comparing favorably with the direct-connected style of drive.

Lower in first cost than direct-connected units, because it uses standard motors.

Consider what these advantages mean to you, when combined with the following "Imperial" features:

A compact, self-contained, accessible design.

Wholly enclosed, dust-proof construction.

Automatic flood lubrication.

Corliss Inlet and Direct Lift discharge valves, mechanically perfect.

Complete cooling and intercooling.

Highest mechanical and compression efficiency.

Is not the "Imperial" Short Belt Drive just the unit you are looking for, for your plant?

NEW YORK **INGERSOLL-RAND CO.** LONDON

Offices in All Principal Cities of the World.

Compressors **Air Tools** **Air Hoists** **Sand Rammers**

MANUFACTURING PLANT FOR SALE

Sandusky, Ohio, has best Harbor on Lake Erie, has five railroads, fine schools, churches and a splendid park system. Has finest bathing beaches and Pleasure Resorts on fresh waters.

The Business Men's Association has given substantial aid to several new industries the past few years.

The plant above, 80 ft. x 196 ft., with separate smith shop and storage shed, with plenty of room for expansion, may be had at a price almost a gift. Railroad switches, front and rear, steam plant and engine and heating system, 50 H. P. Natural Gas engine, shafting, etc., ready to run, with considerable number of machine tools if desired. Adjoins fine foundry. Positively the cheapest plant to operate in the country. Reason for sale, have purchased and now occupy much larger plant.

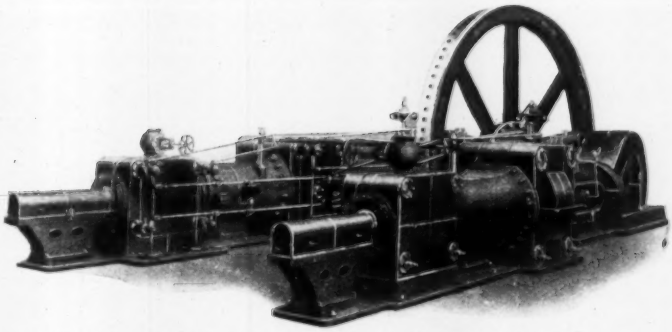
If you want to start a business, write us.

THE SANDUSKY FOUNDRY AND MACHINE CO.

SANDUSKY, OHIO

MESTA MACHINE COMPANY

PITTSBURGH, PA.

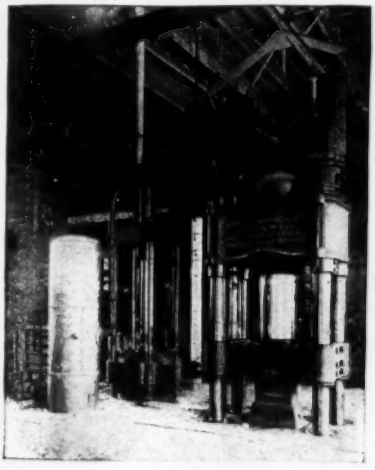


Twin Tandem Cross Compound Corliss Engine Built by Mesta Machine Co.

Steam and Gas Engines
Air Compressors, Condensers
Steam Hydraulic Forging Presses
Cut and Machine Molded Gears
Rolling Mill Machinery

High-Speed Steam-Hydraulic Forging Presses

double your production with one-half your labor cost and steam consumption



COST OF REPAIRS REDUCED

Eliminates Heavy Shocks and Vibration

SINGLE LEVER CONTROL

SMALL SIZES—Single Frame Type
LARGE SIZES—Four Column Type

BUILT FOR ALL CLASSES OF FORGING, SHEARING OR PRESSING

100 Tons to 12,000 Tons Capacity

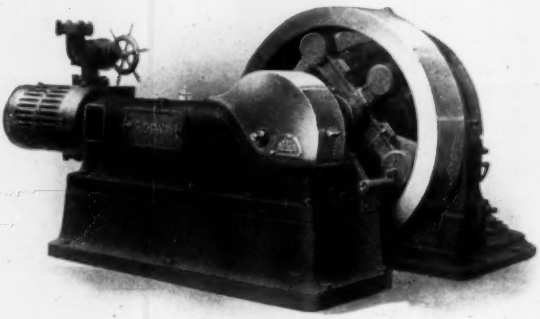
MANUFACTURED UNDER DAVY BROS., LTD., PATENTS

UNITED ENGINEERING & FOUNDRY CO.

2300 FARMERS' BANK BUILDING PITTSBURG, PA.

Ridgway Units

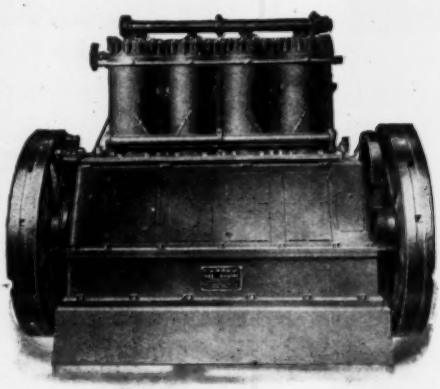
The Units of Unlimited Possibilities



Their design shows careful consideration of the features essential to successful operation — low steam consumption, high electrical efficiency, reliability, and low maintenance expense.

Ridgway Dynamo & Engine Co.
Ridgway, Pa.

Nash Gas Engines



Operating on Producer Gas furnish the most Economical power obtainable.

Preferred for all reliable power requirements. Exceedingly close regulation combined with great economy.

Operate on Gas, Gasoline, Producer Gas, etc.

Sizes: 6 to 425 H. P.

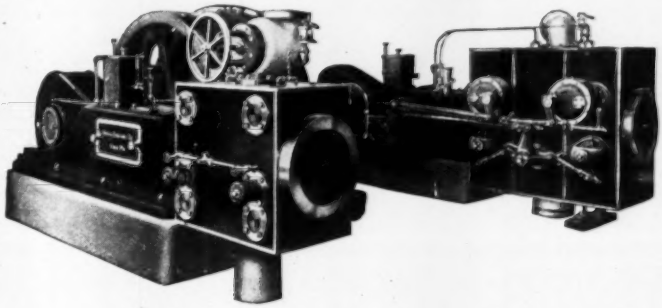
Send for Catalogue

Makers of the world famous Water Meters: Crown, Empire, Nash, Gem, Premier

NATIONAL METER COMPANY

Established 1870 — 84 CHAMBERS STREET, NEW YORK — John C. Kelley Pres.

Chicago Boston Pittsburg San Francisco Cincinnati Los Angeles



BALL CORLISS ENGINE

With Non-Detaching Valve Gear

It was the drop cut-off gear which made the Corliss Engine successful and economical for slow speeds.

The feature which distinguishes our High and Medium Speed Engines and makes them superior to all other four-valve engines is our *patented non-detaching valve gear.*

This gear by positive action gives the valves the *same movement* that the *drop cut-off* of the slow speed Corliss *produces* by picking up and dropping them.

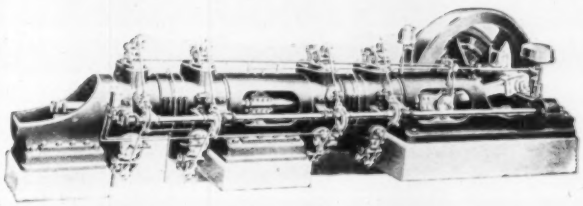
The valve gear opens and closes the valves at the *proper* time, and holds the valves *absolutely still* during over *half a revolution.*

The valves are given the movement necessary for the *greatest durability* and *tightness*, and the *best form* of valve is made possible.

This engine marks the extreme limit of excellence so far reached in economy and quiet running.

BALL ENGINE CO., Erie, Penn.

STEAM GAS



BUCKEYE GAS ENGINES

Owing to the governing system the regulation equals that of any modern steam engine, insuring successful parallel operation. The mixing apparatus is a combination of quantity and quality control, the double ignition system is simple and easily adjusted, the water cooling system is the most efficient devised. Built in horse powers from 50 up, for Natural, illuminating or producer gas.

Send for catalog.

BUCKEYE ENGINE COMPANY

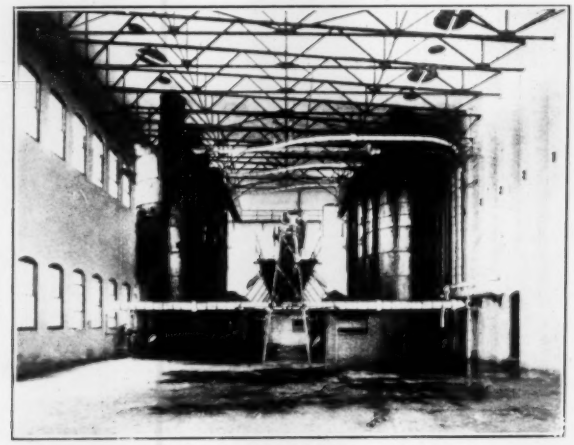
SALEM, OHIO

GAS STEAM

The Improved

Murphy Automatic Furnace

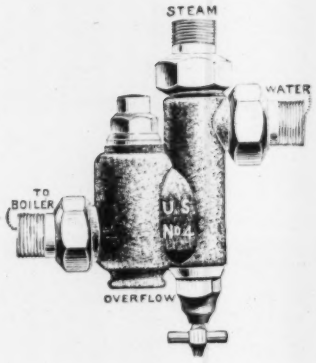
For over 30 years the leading Automatic Stoker—Over 1,500,000 H.P. in operation



UNITED ELECTRIC LIGHT CO., SPRINGFIELD, MASS.

1st order Sept., 1903—900 H.P. 3rd order Mar., 1907—2400 H.P.
2nd " " 1904—1900 H.P. 4th " Jan. 1910—2400 H.P.

Founded 1878 — MURPHY IRON WORKS, Detroit, Mich. — Incorporated 1904



U. S. Automatic Injectors

They give 100 per cent efficiency—are easy to operate, have unusually wide range, never "break" through jarring, are absolutely automatic, *always*.

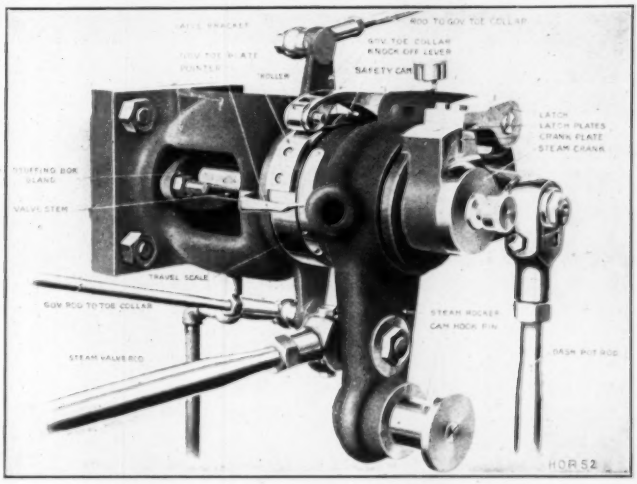
Ask your dealer to show you the U. S. Automatic Injector. Study its construction. Note the Disc Valve on the Delivery Tube, the Overflow Valve and the Drip Cock. These are improvements in Injector-making that bespeak "U. S." superiority anywhere and under any condition.

We want to send you the "Engineer's Red Book" and Catalog "L." You'll find them a wonderful help in solving general boiler-room problems. Send us your name and address.

American Injector Company

DETROIT 184 Fourteenth Ave., MICH.

Hamilton Corliss Gravity Valve Gear



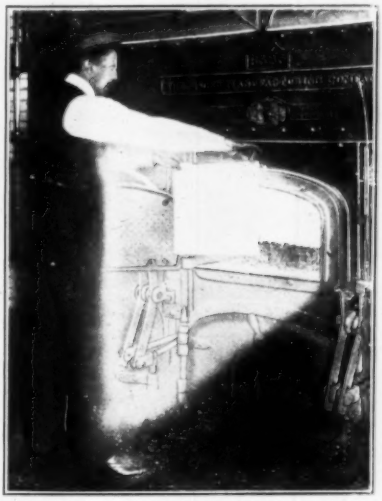
is the best on the market ***because:*** it is compact and simple and has few working parts—will operate noiselessly and positively at speeds up to 175 R.P.M.—is actually a gravity gear, the latch dropping into contact without the necessity of springs—the latch and cam levers are steel forgings, absolutely safe against breakage.

SEND FOR BULLETIN "F"

The Hooven, Owens, Rentschler Co., Hamilton, Ohio

BALANCED DRAFT SYSTEM
OF
FURNACE REGULATION

A Scientific System for Ensuring the Greatest Economy in the Combustion of Fuel in Boilers—Balances your Draft, Automatically Regulates your Air Supply, for All Rates of Combustion. It individualizes your boiler units, making each unit work up to its pro rata share of the total output of the plant—gives a regulation of the air supply with respect to the thickness of fuel bed in each boiler.



A practical demonstration of a "Balanced" Furnace

"It Makes Firing Easy."

FOREIGN LICENSEES:

Hotchkiss & Cie, Paris, France.
Thwaites Bros., Ltd., Bradford, England.
The Westinghouse Company, Ltd., St. Petersburg, Russia.
Societe A. Heintz & Company, Herstal-leg-Liege, Belgium.

THE ENGINEER COMPANY
Hudson Terminal Bldg.
New York, N. Y.

STOP, LOOK AND LISTEN!

Why are we busy and our competitors dull?

The explanation is found in our High Speed Heavy Duty Corliss Engines and **"Franklin" (patent) Horizontal Gravity Latch-Releasing Valve Gear;** marvelous steam economies and close regulation guaranteed. Rotative speeds 150 to 200 revolutions per minute. The maximum of power secured at a minimum of cost—send for catalogue and be convinced.

HEWES & PHILLIPS IRON WORKS

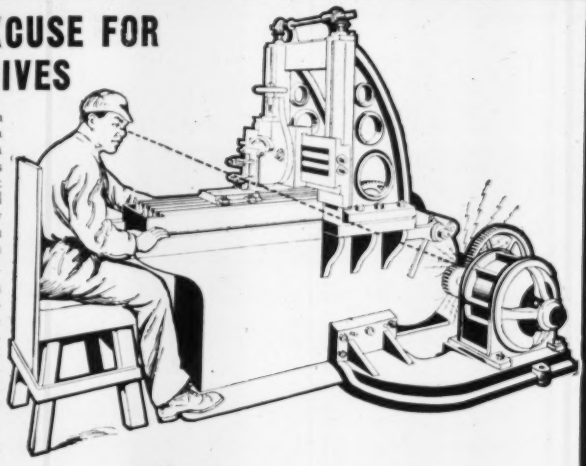
NEWARK, N. J.

THERE'S NO EXCUSE FOR NOISY GEAR DRIVES

Noise in gear drives is only an evidence of preventable wear, a forerunner of destruction and a distraction that takes men's minds from their work. Remove that noise and you do much toward preserving the life and accuracy of the machine. Then, when you complain of their work, your men can't complain of their tools.

New Process Noiseless Pinions stop this noise, vibration and ruin on drives where conditions are most severe. Numerous manufacturers have discarded metal pinions and substituted New Process Pinions as a standard part, and the trouble has been completely overcome.

Try a New Process Pinion on your worst drive. Write for book on "Noiseless Gearing."

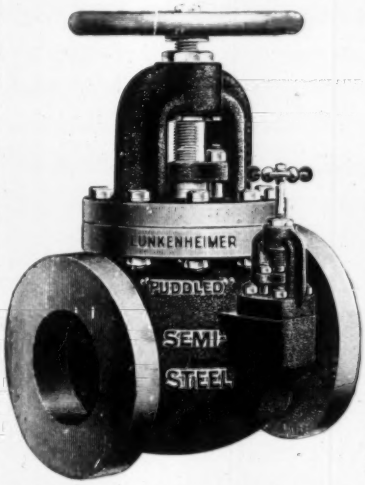


NEW PROCESS IS TO ALL OTHER RAWHIDE AS STEEL IS TO IRON

The NEW PROCESS RAW HIDE Co.

OFFICE & WORKS — N.P.R.H. REGISTERED — SYRACUSE, N.Y.

45



LUNKENHEIMER "PUDDLED" SEMI-STEEL VALVES

The "Puddled" Semi-steel used in Lunkenheimer Valves is an extremely high grade iron and steel alloy of very close grain and great strength, the tensile strength per square inch being 35,000 pounds.

All parts subjected to wear are renewable.

The line includes Globe, Angle, Cross, Check, Gate, Non-return Safety Boiler Stop, Valves, etc., guaranteed for working pressures up to 250 pounds, and made in two combinations as regards the trimmings, to suit various conditions of superheat and meet the specifications of engineers who differ as to the material used.

This line is also made in Cast Steel for extreme conditions of pressure, superheat and strain, and also in Cast Iron for less severe conditions.

"MOST supply houses sell them—yours CAN—if they DONT or WONT—tell *US*."

Write for 1912 catalogue.

THE LUNKENHEIMER COMPANY

Largest Manufacturers of High Grade Engineering Specialties in the World

General Offices and Works: CINCINNATI, OHIO, U. S. A.

New York,	Boston,	Chicago,	London, S. E.,
64-68 Fulton St.	138 High St.	186 N. Dearborn St.	35 Great Dover St.

14

REPEAT ORDERS
A Proof of "Quality"

REPEAT ORDERS are the result of satisfaction to the customer not only after the first purchase, but entire satisfaction after every purchase.

REPEAT ORDERS are the life of a manufacturer—they have a cumulative effect.

REPEAT ORDERS are proof positive of the maintenance of a high standard of manufacture.

REPEAT ORDERS are a feature of the business of Allis-Chalmers Company and one of its biggest assets.

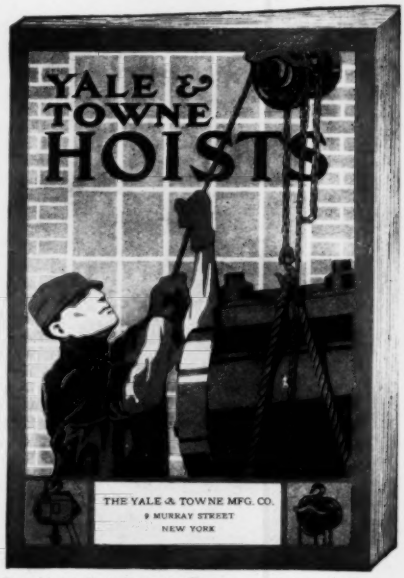
REPEAT ORDERS for Allis-Chalmers machinery are coming from your neighborhood. Ask any user in your vicinity why he specifies this company's apparatus, and receive positive assurance of its quality.

Allis-Chalmers Company

General Offices :: Milwaukee, Wis.

Offices in All Principal Cities

THE TRIPLEX BLOCK



Our New Catalog, 100 Pages, 6 x 9 inches.

This Book Shows the Latest Hoisting Practice

A REQUEST by mail will bring this hand book of hoists. The most practical book for a large or small shop ever published.

Write today before you forget it.

The Yale & Towne Mfg. Co.
The Makers of Yale Products
9 Murray St., New York, U. S. A.
Local Offices:
Chicago, 74 East Randolph Street
San Francisco, 104 Rialto Building

ROEBLING

THE WIRES

in **Roebling** Wire Rope are made from carefully selected, thoroughly tested metals.

They are drawn and treated so as to develop to the fullest extent the strength, toughness and pliability required for high grade rope.

These wires are stranded into rope in accordance with designs proven by long experience to be best adapted for good service.

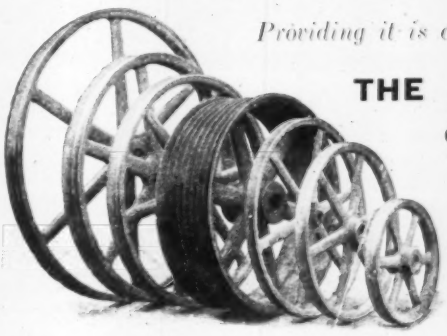
JOHN A. ROEBLING'S SONS COMPANY
TRENTON, N. J.

Agencies and Branches:

New York	Chicago	Atlanta	Cleveland
San Francisco	Los Angeles	Portland, Ore.	Seattle

THE ROPE DRIVE IS THE SUPERIOR SYSTEM FOR TRANSMITTING POWER

Providing it is correctly designed and installed.



THE JEFFREY SYSTEM of Rope Driving

is correctly designed and includes many ingenious, patented features which give all the benefits of economy of space and low first cost.

Our expert Engineers are always at your service to assist you in solving your transmission problems.

The Jeffrey Manufacturing Company
COLUMBUS, OHIO

New York
Boston
Montreal

Pittsburg
Charleston, W. Va.
Atlanta, Ga.
Birmingham

Chicago
St. Louis
Denver
Seattle

GOODRICH CONVEYOR BELT

Lowest cost per ton of material handled

Buying a belt by its first cost is like looking through the wrong end of a telescope—the cost merely *looks* small.

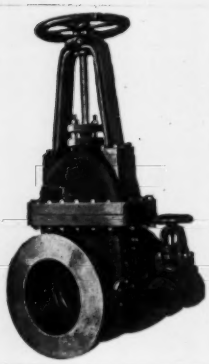
The whole matter of buying conveyor belting should sift down to this one bed-rock point: "How much will it cost me *per ton* of material handled."

You cannot, of course, know from personal experience that Goodrich Conveyor Belts cost least per ton of material handled—but you can be guided by the records of this belt in the hands of others in your particular line.

That is what we are prepared to send you—the records of this belt in the service of others in your line. We will also send you a sample of the belt, and our booklet explaining its construction—you will be glad that you sent for all three. Write:

The B. F. Goodrich Co., Akron O.
Largest in the world

TRADE MARK



WE SPECIALIZE

We concentrate our entire attention on valves and hydrants and do not have a line of miscellaneous sundries such as fittings, boiler trimmings, etc., to divide our interests. Thus we can give valves particular attention.

The result of this concentrated effort is shown in Kennedy Valves—it shows in their design, workmanship and finish.

THE KENNEDY VALVE MFG. CO.

Main Office and Works, 1028 E. Water St., ELMIRA, N. Y.
Branch Office and Warehouse, 45 Beekman St., NEW YORK CITY.
Agencies, 666 Western Union Bldg., Chicago, Ill.
600 Bessemer Bldg., Pittsburg, Pa.
262 Market St., San Francisco, Cal.

Massachusetts Standard Quality

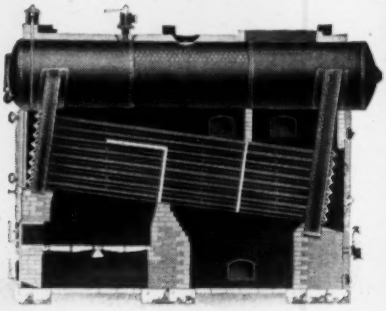
BOILERS

Return Tubular Internally Fired Upright and Water Tube

PLATE WORK OF EVERY DESCRIPTION

ROBB ENGINEERING CO. Ltd.

Waverly St., South Framingham, Mass.



SCOTCH BOILERS

DRY AND WATER BACK

THE
KINGSFORD
WATER TUBE BOILER

KINGSFORD FOUNDRY & MACHINE WORKS
OSWEGO, N. Y.

THE JANUARY JOURNAL

We will pay $0.25 a copy for the
January 1912 issue of The Journal

The American Society of Mechanical Engineers

29 W. 39th St., New York

THE BABCOCK & WILCOX COMPANY

85 LIBERTY STREET, NEW YORK

Water Tube Steam Boilers

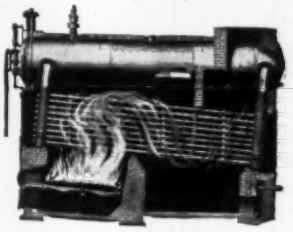
STEAM SUPERHEATERS MECHANICAL STOKERS

Works: BARBERTON, OHIO BAYONNE, N. J.

BRANCH OFFICES

BOSTON, 35 Federal St.
PITTSBURGH, Farmers Deposit Bank Bldg
SALT LAKE CITY, 313 Atlas Block
CLEVELAND, New England Bldg
LOS ANGELES, American Bank Bldg
PHILADELPHIA, North American Bldg.
NEW ORLEANS, Shubert Arcade.
CHICAGO, Marquette Bldg
PORTLAND, ORE., Wells-Fargo Bldg.
SEATTLE, Mutual Life Bldg
SAN FRANCISCO, 99 First Street
DENVER, 435 Seventeenth Street
ATLANTA, Candler Bldg
HAVANA, CUBA, 116½ Calle de la Habana
CINCINNATI, Traction Bldg

WATER TUBE, INTERNAL FURNACE AND RETURN TUBULAR



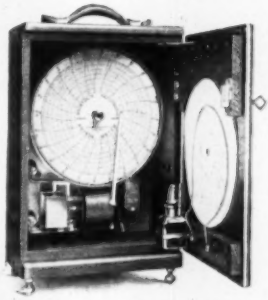
BOILERS

ALL WROUGHT STEEL CONSTRUCTION

E. KEELER COMPANY

Established 1864 WILLIAMSPORT, PA.

New York Boston Philadelphia Pittsburgh Chicago San Francisco



CONTINUOUS RECORDS

of Pressure, Temperature, Electricity, Speed and Time are obtained automatically by means of

BRISTOL'S RECORDING INSTRUMENTS

Write for new 48-page Bulletin No. 132 cataloguing Bristol's Recording Ammeters as illustrated, herewith.

THE BRISTOL COMPANY, Waterbury, Conn.

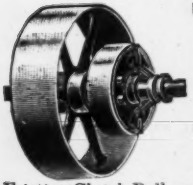
JENKINS BROS. CHECK VALVES

are made from Standard and Extra Heavy pattern, both brass and iron body in several different styles—horizontal, angle, vertical, swing. All are fitted with the Jenkins Disc, thus assuring a tight seat. And as the Jenkins Disc takes practically all the wear, the seat is seldom injured, and valves give long and satisfactory service without requiring attention or repair.

Catalogue mailed on request.

JENKINS BROS. NEW YORK BOSTON PHILADELPHIA CHICAGO

THE A. & F. BROWN CO.



Friction Clutch Pulleys and Couplings

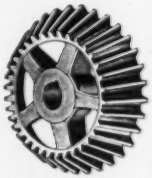
ENGINEERS, FOUNDERS, MACHINISTS AND MILLWRIGHTS

POWER TRANSMISSION MACHINERY

DESIGNED, FURNISHED AND ERECTED

SPECIAL MACHINERY

IRON CASTINGS



Gears of all kinds and sizes

WORKS: ELIZABETHPORT NEW JERSEY

SALES ROOM: 172 FULTON ST., NEW YORK CITY

THE H·J·REEDY COMPANY INC.

CINCINNATI, O.

NOT IN THE TRUST

ELEVATORS

EVERY TYPE

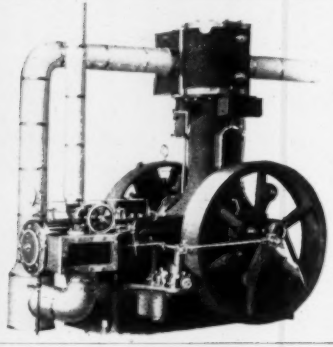
Power Transmission Appliances

FRICTION CLUTCH PULLEYS
FRICTION CLUTCH COUPLINGS
FRICTION CLUTCH QUILLS
FRICTION CLUTCH OPERATORS
FRICTION CLUTCH SHEAVES
FLOOR STANDS
HEAVY MILL BEARINGS
SHAFT COUPLINGS
SHEAVES AND TENSION CARRIAGES
PULLEYS AND FLY WHEELS

FALLS CLUTCH and MACHINERY CO.

CUYAHOGA FALLS, OHIO, U. S. A.

NEW YORK CITY, 206 Fulton St. BOSTON, 54 Purchase St. CINCINNATI, 208 Elm St.

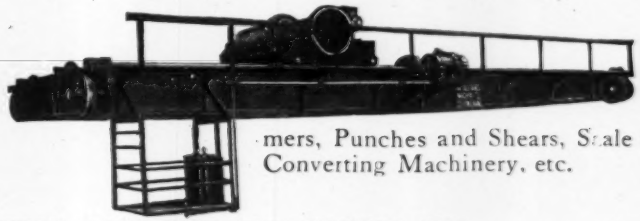


WRITE for a copy of our booklet entitled "The Modern High Speed Automatic Engine," which describes

The American Ball Angle Compound Engine

AMERICAN ENGINE COMPANY
42 RARITAN AVE., BOUND BROOK N. J.

ALLIANCE CRANES All Types



Also Rolling Mill and Hydraulic Machinery, Steam Hammers, Punches and Shears, Scale Cars, Copper Converting Machinery, etc.

THE ALLIANCE MACHINE CO. ALLIANCE, OHIO

Pittsburg Office, Frick Building Birmingham Office, Woodward Building

COMPLETE FOUNDRY EQUIPMENT

For Grey Iron, Brass, Car Wheel, Pipe, Steel & Malleable Casting Plants. Buildings designed and furnished. Equipment installed. Initial operation conducted by our experts at moderate charge.

All types of CRANES for every service

Practical designs
Reliable construction

WHITING
FOUNDRY EQUIPMENT CO.
HARVEY-ILL. U.S.A.
CHICAGO SUBURB

Catalogs and full information on request

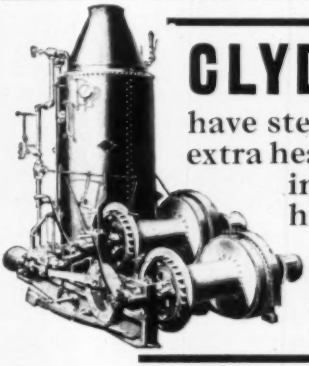
Elevators

Papers read before The American Society of Mechanical Engineers

No.		Price
820	Elevator, C. R. Pratt	$0.50
940	Elevator Safeties, C. R. Pratt	.10
981	Test of a Hydraulic Elevator System, R. P. Bolton	.10
1128	Test of a Plunge Elevator Plant, A. J. Herschmann	.30
1161	A High-Speed Elevator, C. R. Pratt	.40
1300	Operating Conditions of Passenger Elevators, R. P. Bolton	.10
		$1.50

Members' rates are half price

Address CALVIN W. RICE, SECRETARY, 29 West 39th St., New York



CLYDE Hoisting Engines

have steel gears and ratchets. Shafting is extra heavy with long bearings. Connecting rods have solid ends. Boilers have large heating surface.

Large stocks on hand—Ask for catalogue.

CLYDE IRON WORKS, DULUTH, MINN.

CHICAGO, ILL. 318-19 Fisher Bldg. NEW YORK NEW ORLEANS SAVANNAH HOUSTON

INDIVIDUAL SANITARY WASH BOWLS

Arranged in Single or Double Batteries, of Practically Any Number of Bowls:—

Hot and Cold or Cold Water Only. Plain Nozzle, Self-Closing or Compression Bibbs:—

Plain Cast Iron, Galvanized Iron or Vitrified Porcelain Enameled Iron Bowls.

Send for complete catalog of our full line of all metal Shop and Factory Equipment, Sanitary Wash Bowls, Improved Soda Kettles, Improved Stools, Work Benches, Stock Racks, Sanitary Drinking Fountains, etc.

MANUFACTURING EQUIPMENT & ENGINEERING COMPANY, BOSTON, MASS.

SRB

All Standard Bearings

are fully described in our

New Catalog 24A

Send for it.

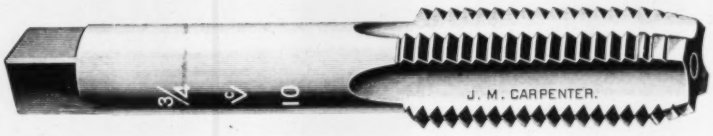
SRB

Standard Roller Bearing Company
Philadelphia

TRADE MARK

C

REGISTERED



Dealers are authorized to fully warrant Carpenter's Taps. Should, by chance, **any imperfect tool get away from our plant, we desire to replace it. Specify Carpenter's.**

42 Years on the Market.

J. M. CARPENTER TAP & DIE CO., Pawtucket, R. I.

MANNING, MAXWELL & MOORE

INCORPORATED

Machine Tools, Electric Cranes and Engineering Specialties

85-87-89 LIBERTY STREET NEW YORK

Simplex not Duplex
"To be simple
is to be great"

Steam and Power Pumping Machinery

—For every service—

Compound Packed Plunger Pump.

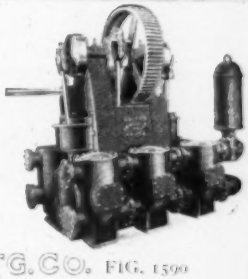
American Compound Pumps working on Elevator or Water Works service have shown a very low steam consumption and a minimum maintenance cost.

They have been found reliable and ready to work with the Governor.

Our No. 18 Catalogue goes into details.

American Steam Pump Company, Battle Creek, Mich. U. S. A.

GOULDS DOUBLE-ACTING TRIPLEX PUMP—FIG. 1590



This pump is used extensively for general water supply, municipal water works, hydraulic elevators, pulp grinders, etc.

Made in capacities up to 91,500 gallons per hour.

Write for bulletins.

GOULDS PUMPS

Trade Mark

THE GOULDS MFG.CO. FIG. 1590

LARGEST MFR.S OF PUMPS FOR EVERY SERVICE

78 W. Fall Street

Seneca Falls, N. Y.

Branches and Agencies in All Important Cities

CENTRIFUGAL PUMPING MACHINERY

Of all Descriptions

MORRIS MACHINE WORKS

BALDWINSVILLE, N. Y.

HENION & HUBBELL, Agents, 61-69 N. Jefferson Street, Chicago, Ill.

H. A. PAINE, Agent, Houston, Tex.

New York Office, 139-41 Cortlandt Street

"The Chart tells the Story"

BULLETIN No. 68, Describing the Venturi Hot Water Meter

will be mailed to any address

We furnish Venturi Meters for Cold Water, Hot Water, Brine, Sewage, Air, Gas, Steam, Etc.

Builders Iron Foundry : Providence, R. I.

ENGINEERING SCHOOLS and COLLEGES

NEW YORK UNIVERSITY SCHOOL OF APPLIED SCIENCE

Departments of Civil, Mechanical and Chemical Engineering.

For announcements or information, address

Charles Henry Snow, *Dean*,

UNIVERSITY HEIGHTS, N. Y. CITY.

POLYTECHNIC INSTITUTE OF BROOKLYN

Course in Mechanical Engineering. Evening Post-Graduate Courses. Fred. W. Atkinson, Ph. D., President; W. D. Ennis, Member A. S. M. E., Professor Mechanical Engineering.

TUFTS COLLEGE

Department of Engineering. Civil, Mechanical, Electrical and Chemical Engineering. New laboratories and excellent equipment. Beautiful site within four miles of Boston. Preparatory department for students who have had engineering practice, but insufficient preparation for college work. For information concerning courses and positions of graduates, address

Prof. G. C. Anthony, *Dean*,

TUFTS COLLEGE P. O., MASS.

THE RENSSELAER POLYTECHNIC INSTITUTE

Courses in Civil, Mechanical and Electrical Engineering and General Science leading to the degrees, C. E., M. E., E. E. and B. S.

Unsurpassed laboratories for Mechanical and Electrical Engineering.

Catalogue sent upon application. TROY, N.Y.

PROFESSIONAL CARDS

THE ARNOLD COMPANY

Engineers—Constructors

Electrical—Civil—Mechanical

105 South La Salle Street, CHICAGO.

ELECTRICAL TESTING LABORATORIES

Electrical and Mechanical Laboratories

Tests of Electrical Machinery, Apparatus and Supplies. Materials of Construction, Coal, Paper, etc. Inspection of Material and Apparatus at Manufactories.

80th Street and East End Avenue,

NEW YORK CITY.

BERT L. BALDWIN

Member A. S. M. E. and A. I. E. E.

Plans, Specifications and Superintendence of Manufacturing Buildings, Plants and Equipments of same.

Perin Building, CINCINNATI, OHIO

CHAS. T. MAIN

Member A. S. M. E.

Mill Engineer and Architect

201 Devonshire Street, BOSTON, MASS.

J. WM. PETERSON

Lubrication Engineer

Specialty: Plans, Specifications and Superintendence of Power Plant Oiling Systems and General Machinery Lubrication

50 Church Street NEW YORK CITY

F. W. Dean H. M. Haven Wm. W. Crosby

Members A. S. M. E.

F. W. DEAN, INC.

Mill Engineers and Architects,

Exchange Building, 53 State St.,

BOSTON, MASS.

SPECIAL RATES

Will be quoted on request for Professional Cards.

MACHINE SHOP EQUIPMENT

THE ALLEN MFG. CO. Inc.

HARTFORD, CONN.

Allen Patent Safety Set Screws. Made from high-test steel bars and warranted fully as strong as the best projecting screw made, besides eliminating danger on rotating shafts. Ask your dealer for them.

SAFETY SET SCREW

BUTTERFIELD & CO.

Derby Line, Vt. New York, 126 Chambers St. Rock Island, P. Q.

Manufacturers of Taps, Dies, Screw Plates, Stocks and Dies, Tap Wrenches, and all Thread Cutting Tools. Our goods are not surpassed by any in the world.

TAPS AND DIES

THE CARBORUNDUM COMPANY

NIAGARA FALLS, N. Y.

Sole manufacturers in America of Carborundum, the hardest, sharpest, quickest cutting and most uniformly perfect abrasive material known. The Carborundum products include: Grinding Wheels for every possible grinding need, Sharpening Stones, Oil Stones, Rubbing Bricks, Carborundum Paper and Cloth, Valve Grinding Compound, Carborundum Grains and Powders, and Garnet Paper.

CARBORUNDUM PRODUCTS

THE J. M. CARPENTER TAP & DIE CO.

PAWTUCKET, R. I.

Carpenter's Tools for cutting Screw Threads, Taps, Dies, Screw Plates, Dies and Stocks, Tap Wrenches, etc., have been 38 years on the market and 38 years in the lead.

TAPS AND DIES

THE FELLOWS GEAR SHAPER CO.

SPRINGFIELD, VT.

The Gear Shaper cuts the smoothest gears in use, because the cutter is a theoretically correct generating tool and is ground after being hardened. It is also the fastest machine on the market by 25 to 50%. Literature gives reasons in detail.

GEAR SHAPERS

THE GARVIN MACHINE COMPANY

137 Varick St. NEW YORK CITY

Manufacturers of a complete line of Plain and Universal Milling Machines, Screw Machines, Monitor Lathes, Tapping Machines, Duplex Drill, Lathes, Speed Lathes, Cutter Grinders, Automatic Chucks, etc.

MILLING MACHINES

THE HEALD MACHINE COMPANY

WORCESTER, MASS.

Manufacturers of Grinding Machines. Internal Grinders, Cylinder Grinders, Surface Grinders, Drill Grinders.

GRINDING MACHINES

AIR COMPRESSORS AIR TOOLS AND HOISTS

INGERSOLL-RAND COMPANY

11 Broadway NEW YORK

Air Compressors, twenty standard types, capacity 8 to 8000 cu. ft. per minute; "Crown" and "Imperial" Air Hammers and Drills, all sizes; "Imperial" Air Motor Hoists, capacity ½ to 5 tons.

TURRET LATHES

JONES & LAMSON MACHINE CO.

SPRINGFIELD, VT.

Manufacturers of the Hartness Flat Turret Lathe; made in two sizes for both bar and chuck work.

HEAVY DUTY BORING MILLS

THE KING MACHINE TOOL CO.

CINCINNATI, O.

Vertical Turret Machines, 28″ and 34″. Vertical Boring and Turning Machines, 42″ to 84″, inclusive.

LATHES MILLING MACHINES

THE R. K. LE BLOND MACHINE TOOL CO.

CINCINNATI, OHIO

We manufacture a complete line of Heavy Duty Lathes and Milling Machines. They are scientifically designed, so the power is limited only by the strength of the cutting tool. It will pay you to investigate our machines. Catalogue upon request.

MACHINE TOOLS

ENGINEERING SPECIALTIES

MANNING, MAXWELL & MOORE, Inc.

SINGER BUILDING, NEW YORK

Are the largest and best known distributors of Machine Tools in the world and carry in stock the product of the foremost designers of the many branches of machine tool building in the United States.

METAL SHOP AND FACTORY EQUIPMENT

MANUFACTURING EQUIPMENT & ENGINEERING CO.

BOSTON, MASS.

We manufacture a full line of all metal Shop and Factory Equipment, Sanitary Wash Bowls, Improved Soda Kettles, Improved Stools, Work Benches, Stock Racks, Sanitary Drinking Fountains, etc.

PINIONS AND GEARS

THE NEW PROCESS RAW HIDE CO.

SYRACUSE, N. Y.

Manufacturers of New Process Noiseless Pinions and also of accurately cut Metal Gears of all kinds.

PRECISION BENCH LATHES

WALTHAM MACHINE WORKS

WALTHAM, MASS.

Our Bench Lathes swing 8″, will take ¾″ rod through the chuck and the workmanship is of the highest watch machine standard. It is a necessity in the modern tool room. Catalog for those interested. Also makers of Automatic Precision Bench Machinery.

THE WARNER & SWASEY COMPANY

CLEVELAND, OHIO

BRANCH OFFICES: NEW YORK CHICAGO DETROIT

We offer a most complete line of high-grade Turret Lathes for producing work accurately, rapidly and economically. Our catalog, which describes these machines fully, will be mailed on request.

TURRET LATHES

WELLS BROTHERS COMPANY

GREENFIELD, MASS.

We make and sell the Little Giant line of Taps, Dies, Screw Cutting Tools and Machinery.

TAPS AND DIES

STEAM ENGINES AND BOILERS

ALMY WATER TUBE BOILER CO.

PROVIDENCE, R. I.

Manufacturers of Almy Patent Sectional Water Tube Boilers for steamships, river steamers, both propeller and stern wheel, torpedo boats, fire boats, launches. Donkey Boilers for steamships and for all kinds of stationary work.

WATER TUBE BOILERS

AMERICAN ENGINE CO.

42 RARITAN AVE. BOUND BROOK, N. J.

Builders of American Ball Angle Compound Engines. Angle compound, 80 to 1,000 h. p.; double angle compound, 160 to 2,000 h. p.; four cylinder triple, 120 to 1,600 h. p.

ENGINES

THE BABCOCK & WILCOX COMPANY

85 LIBERTY STREET, NEW YORK

Water Tube Steam Boilers, Steam Superheaters, Mechanical Stokers.

WATER TUBE BOILERS

BALL ENGINE COMPANY

ERIE, PA.

Builders of Ball Single Valve Automatic and High Speed Corliss Engines with non-detaching valve gear, for direct connection, or belting to electric generators.

STEAM ENGINES

BUCKEYE ENGINE CO.

SALEM, OHIO

Builders of Steam and Gas Engines; high in duty, superior in regulation. Buckeye Four-Stroke Cycle Gas Engine, single and double-acting, in powers from 50 to 6000 h. p.

ENGINES STEAM AND GAS

AIR COMPRESSORS AIR TOOLS AND HOISTS

INGERSOLL-RAND COMPANY

11 Broadway NEW YORK

Air Compressors, twenty standard types, capacity 8 to 8000 cu. ft. per minute; "Crown" and "Imperial" Air Hammers and Drills, all sizes; "Imperial" Air Motor Hoists, capacity ½ to 5 tons.

TURRET LATHES

JONES & LAMSON MACHINE CO.

SPRINGFIELD, VT.

Manufacturers of the Hartness Flat Turret Lathe; made in two sizes for both bar and chuck work.

HEAVY DUTY BORING MILLS

THE KING MACHINE TOOL CO.

CINCINNATI, O.

Vertical Turret Machines, 28″ and 34″. Vertical Boring and Turning Machines, 42″ to 84″, inclusive.

LATHES MILLING MACHINES

THE R. K. LE BLOND MACHINE TOOL CO.

CINCINNATI, OHIO

We manufacture a complete line of Heavy Duty Lathes and Milling Machines. They are scientifically designed, so the power is limited only by the strength of the cutting tool. It will pay you to investigate our machines. Catalogue upon request.

MACHINE TOOLS

ENGINEERING SPECIALTIES

MANNING, MAXWELL & MOORE, Inc.

SINGER BUILDING, NEW YORK

Are the largest and best known distributors of Machine Tools in the world and carry in stock the product of the foremost designers of the many branches of machine tool building in the United States.

METAL SHOP AND FACTORY EQUIPMENT

MANUFACTURING EQUIPMENT & ENGINEERING CO.

BOSTON, MASS.

We manufacture a full line of all metal Shop and Factory Equipment, Sanitary Wash Bowls, Improved Soda Kettles, Improved Stools, Work Benches, Stock Racks, Sanitary Drinking Fountains, etc.

PINIONS AND GEARS

THE NEW PROCESS RAW HIDE CO.

SYRACUSE, N. Y.

Manufacturers of New Process Noiseless Pinions and also of accurately cut Metal Gears of all kinds.

PRECISION BENCH LATHES

WALTHAM MACHINE WORKS

WALTHAM, MASS.

Our Bench Lathes swing 8″, will take ⅝″ rod through the chuck and the workmanship is of the highest watch machine standard. It is a necessity in the modern tool room. Catalog for those interested. Also makers of Automatic Precision Bench Machinery.

THE WARNER & SWASEY COMPANY

CLEVELAND, OHIO

BRANCH OFFICES: NEW YORK CHICAGO DETROIT

We offer a most complete line of high-grade Turret Lathes for producing work accurately, rapidly and economically. Our catalog, which describes these machines fully, will be mailed on request.

TURRET LATHES

WELLS BROTHERS COMPANY

GREENFIELD, MASS.

We make and sell the Little Giant line of Taps, Dies, Screw Cutting Tools and Machinery.

TAPS AND DIES

STEAM ENGINES AND BOILERS

ALMY WATER TUBE BOILER CO.

PROVIDENCE, R. I.

Manufacturers of Almy Patent Sectional Water Tube Boilers for steamships, river steamers, both propeller and stern wheel, torpedo boats, fire boats, launches. Donkey Boilers for steamships and for all kinds of stationary work.

WATER TUBE BOILERS

AMERICAN ENGINE CO.

42 RARITAN AVE. BOUND BROOK, N. J.

Builders of American Ball Angle Compound Engines. Angle compound, 80 to 1,000 h. p.; double angle compound, 160 to 2,000 h. p.; four cylinder triple, 120 to 1,600 h. p.

ENGINES

THE BABCOCK & WILCOX COMPANY

85 LIBERTY STREET, NEW YORK

Water Tube Steam Boilers, Steam Superheaters, Mechanical Stokers.

WATER TUBE BOILERS

BALL ENGINE COMPANY

ERIE, PA.

Builders of Ball Single Valve Automatic and High Speed Corliss Engines with non-detaching valve gear, for direct connection, or belting to electric generators.

STEAM ENGINES

BUCKEYE ENGINE CO.

SALEM, OHIO

Builders of Steam and Gas Engines; high in duty, superior in regulation. Buckeye Four-Stroke Cycle Gas Engine, single and double-acting, in powers from 50 to 6000 h. p.

ENGINES STEAM AND GAS

STEAM BOILERS AND ENGINES FEED-WATER HEATERS

ERIE CITY IRON WORKS

ERIE, PA.

Boilers: water tube, horizontal tubular, return tubular, water bottom portable, open bottom portable, vertical tubular and vertical water tube. Engines: Erie City "Lentz," four valve, enclosed high speed, automatic, center crank, side crank, portable and Feed-Water Heaters from 25 to 600 h.p.

STEAM ENGINES

HARRISBURG FOUNDRY & MACHINE WORKS

HARRISBURG, PA.

Manufacturers of Fleming-Harrisburg Horizontal Engines, Corliss and Single Valve, Simple, Tandem and Cross Compound.

STEAM ENGINES

HEWES & PHILLIPS IRON WORKS

NEWARK, N. J.

Makers of improved Patent, Double Port Corliss Engines, Heavy Duty or Girder Frame, Simple or Compound, having our new Franklin High-speed Liberating Valve Gear.

ENGINES TURBINES CASTINGS

THE HOOVEN, OWENS, RENTSCHLER CO.

HAMILTON, OHIO

Manufacturers of Hamilton Corliss Engines, Hamilton High Speed Corliss Engines, Hamilton Holzwarth Steam Turbines, Special Heavy Castings.

BOILERS

E. KEELER COMPANY

WILLIAMSPORT, PA.

Water Tube, Internal Furnace and Return Tubular Boilers. Self-Supporting Stacks, Feed Water Heaters.

BOILERS

KINGSFORD FOUNDRY & MACHINE WORKS

OSWEGO, NEW YORK

Scotch Boilers, Dry and Waterback; also Improved Manning Vertical Boilers, and Special Boilers for Steam Heating.

COMPLETE POWER PLANT EQUIPMENT

MESTA MACHINE CO.

PITTSBURGH, PA.

Complete Power Plant Equipment; Gas and Steam Engines; Condensers; Air Compressors; Power Transmission Machinery.

STEAM ENGINES

PROVIDENCE ENGINEERING WORKS

PROVIDENCE, R. I.

Rice & Sargent Corliss Engines, Improved Greene Engines and Repair Parts, Special Machinery.

RIDGWAY DYNAMO & ENGINE CO.

RIDGWAY, PA.

ENGINES
GENERATORS

Ridgway Engines; four-valve, cross compound, belted, single-valve, tandem compound, direct connected. Ridgway Generators; alternating current, direct current, belted and engine types.

ROBB ENGINEERING CO., LTD.

Waverly St., SOUTH FRAMINGHAM, MASS.

131 State St., BOSTON — 90 West St., NEW YORK

BOILERS

Robb-Brady Internally Fired Boiler, Water Tube, Return Tubular, and other types of boilers; Smoke Stacks, Tanks, etc.

THE VILTER MFG. CO.

1070-1088 Clinton St. — MILWAUKEE, WIS.

Established 1867

ENGINES
REFRIGERATING MACHINERY

Builders of Corliss Engines, Girder or Heavy Duty Type Bed for Belted or Direct-Connected Service, medium or high speed. Ice and Refrigeration Machines.

THE WESTINGHOUSE MACHINE CO.

EAST PITTSBURG, PA.

TURBINES
ENGINES
GAS PRODUCERS
CONDENSERS
STOKERS

Designers and builders of Steam Turbines, Steam Engines, Gas Engines, Gas Producers, Condensers and Mechanical Stokers.

GAS ENGINES AND GAS PRODUCERS

ALLIS-CHALMERS COMPANY

MILWAUKEE, WISCONSIN

GAS ENGINES

Builders of Gas Engines to operate on producer gas, natural gas or furnace gas, capacities from 300 to 5000 B.H.P.

DE LA VERGNE MACHINE COMPANY

1123 E. 138th St. — NEW YORK CITY

REFRIGERATING and ICE MAKING MACHINERY
OIL AND GAS ENGINES

Refrigerating and Ice Making Machinery, 5 to 600 tons capacity; Oil Engines up to 360 B. H. P.; Gas Engines 75 to 2400 B. H. P.

AUGUST MIETZ IRON FOUNDRY & MACHINE WORKS

123 Mott St., NEW YORK

OIL ENGINES

Oil Engines, Marine and Stationary, 2–400 h.p., 150,000 h.p. in operation. Direct coupled or belted to Generators, Air Compressors, Pumps, Hoists, etc., etc.

GAS ENGINES AND PRODUCERS

NATIONAL METER COMPANY

NEW YORK CHICAGO BOSTON

Nash Gas Engines and Producers are capable of running at their rated load for ten consecutive hours on one charge of fuel; will develop a B. h. p. hour on one pound of coal; are reliable because they're Nash.

GAS PRODUCERS

THE SMITH GAS POWER CO.

LEXINGTON, OHIO

Builders of Smith Automatic Gas Producers, both suction and pressure types. Mechanically Operated Gas Producers in large units for power and heating plants. Tar Extractors and Gas Cleaning Plants.

POWER PLANT AUXILIARIES AND SPECIALTIES

VALVES SLIDE and PISTON DISTRIBUTION

AMERICAN BALANCE VALVE CO.

JERSEY SHORE, PENNA.

We make Balanced Slide and Piston Valves for Manufacturers of Steam Engines, also for Old Power Equipment, from Steam Pumps to Battleships. Write us.

INJECTORS

AMERICAN INJECTOR COMPANY

DETROIT, MICH.

U. S. Automatic Injectors, Ejectors, Jet Pumps, Drive Well Jet Pumps, Exhaust Injectors, Fire Plugs, Grease Cups, Oil Cups, Oil Pumps, Water Gages, Gage Cocks, lubricating devices and other steam specialties.

VALVES GAUGES INDICATORS

AMERICAN STEAM GAUGE AND VALVE MFG. CO.

BOSTON, MASS. ESTABLISHED 1851

Pressure and Recording Gauges, Engine Room Clocks and Counters for all purposes. Iron and Brass Pop Safety and Relief Valves for stationary, marine and locomotive use. The American Thompson Improved Indicator with new improved detent motion.

VALVES GAGES

THE ASHTON VALVE CO.

BOSTON NEW YORK CHICAGO

Makers of the Ashton Pop Safety Valves, Water Relief Valves, Blow Off Valves, Pressure and Vacuum Gages. All of a superior quality and guaranteed to give greatest efficiency, durability and perfect satisfaction.

OIL AND TAR BURNERS

FURNACES

W. N. BEST

11 Broadway NEW YORK CITY

Apparatus for and technical information relative to all forms of liquid fuel equipment.

THE BRISTOL COMPANY
WATERBURY, CONN.

Bristol's Recording Pressure and Vacuum Gauges. Bristol's Recording Thermometers. The Wm. H. Bristol Electric Pyrometers. Bristol's Recording Voltmeters, Ammeters and Wattmeters. Bristol's Recording Water Level Gauges. Bristol's Time Recorders and Bristol's Patent Steel Belt Lacing.

RECORDING GAUGES and INSTRUMENTS

CHAPMAN VALVE MANUFACTURING CO.
INDIAN ORCHARD, MASS.

BOSTON NEW YORK ST. LOUIS PITTSBURGH CHICAGO PHILADELPHIA SAN FRANCISCO

Brass and Iron Valves for steam, water, gas, oil, etc. Sluice Gates. Send for catalogue.

VALVES

CROSBY STEAM GAGE AND VALVE CO.
BOSTON, MASS.

Steam, Gas, Hydraulic Indicators; Stationary, Marine, Locomotive Safety Valves; Gages for all purposes; Recording Instruments; Chime Whistler; Sight Feed Lubricators; Globe and Angle Valves, Iron and Brass, for high pressures; Blow-off Valves; Gage Testing Instruments; Boiler Testing Instruments; Planimeters and other specialties.

STEAM APPLIANCES

THOS. H. DALLETT CO.
YORK AND 23RD STS. PHILADELPHIA, PA.

Manufacturers of a complete line of Air Compressors, suitable for high-class installations. Equipped with special "Silent" inlet and discharge valves. Also Pneumatic Boiler Scalers for cleaning boiler sheets, drums, condensers, etc. Send for literature.

AIR COMPRESSORS
PNEUMATIC BOILER SCALERS

THE ENGINEER COMPANY
50 CHURCH ST. NEW YORK, N. Y.

"Economy" and "Increased Capacity" obtained by the Upbuilding of Furnace Efficiency when operating with the Balanced Draft System.

(Trade Mark "Balanced" Reg. U. S. Pat. Office.)

BALANCED DRAFT SYSTEM
McLEAN PATENTS

HILLS McCANNA COMPANY
153 W. KINZIE ST. CHICAGO, ILL.

Force Feed Lubrication Pumps made in any number of Feeds or Compartments.

LUBRICATION PUMPS

HOMESTEAD VALVE MANUFACTURING CO.
WORKS: HOMESTEAD, PA. PITTSBURG, PA.

Manufacturers of "Homestead Valves." Straightway, Three-way and Four-way, for blow-off or for highest pressure and most difficult service for water, air or steam. Valves unlike all others.

VALVES

THE HUGHSON STEAM SPECIALTY CO.
CHICAGO, ILL.

Manufacturers of Regulating Valves for all pressures and for steam, air and water. The best and only absolutely noiseless Combination Back Pressure and Relief Valve. Pump Regulators, Separators, Steam Traps, Automatic Stop and Check Valves. Write for complete catalogue.

VALVES
STEAM TRAPS
SEPARATORS
REGULATORS

AIR COMPRESSORS AIR TOOLS AND HOISTS

INGERSOLL-RAND COMPANY

11 Broadway NEW YORK

Air Compressors, twenty standard types, capacity 8 to 8000 cu. ft. per minute; "Crown" and "Imperial" Air Hammers and Drills, all sizes; "Imperial" Air Motor Hoists, capacity ½ to 5 tons.

VALVES PACKING DISCS

JENKINS BROS.

NEW YORK BOSTON PHILADELPHIA CHICAGO

Manufacturers of the genuine Jenkins Bros. Valves, Jenkins Discs, Jenkins '96 Packing, Jenkins Bros. Pump Valves, Jenkins Gasket Tubing. Sole agents for Sellers' Restarting Injector. Catalog mailed on request.

MAGNESIA ASBESTOS and BRINE PIPE COVERINGS

ROBERT A. KEASBEY CO.

100 N. Moore St. NEW YORK CITY

Telephone: 6097 Franklin

Heat and Cold Insulating Materials. Headquarters for 85% Magnesia Asbestos and Brine Pipe Coverings, Asbestos Products, etc.

VALVES

THE KENNEDY VALVE MANUFACTURING CO.

ELMIRA, N. Y. 57 Beekman St., NEW YORK

Manufacturers of Valves for various purposes and pressures; Hydrants; Indicator Valves for Automatic Sprinkler Equipment.

VALVES BLOW-OFF VALVES FIRE HYDRANTS

THE LUDLOW VALVE MFG. CO.

TROY, N. Y.

Manufacturers of genuine Ludlow Gate Valves for all purposes. Special Blow-off Valves. Check Valves. Foot Valves. Sluice Gates. Indicator Posts. Fire Hydrants.

VALVES INJECTORS LUBRICATORS ETC

THE LUNKENHEIMER COMPANY

CINCINNATI, OHIO

Manufacturers of high-grade engineering specialties, comprising Brass and Iron Valves Whistles, Cocks, Gauges, Injectors, Lubricators Oil Pumps, Oil and Grease Cups, etc., adapted to the requirements of all classes of machinery.

VALVES

MONARCH VALVE & MANUFACTURING CO.

39 Cortlandt St., NEW YORK SPRINGFIELD, MASS.

Manufacturers of Bronze and Iron Bodied Valves for various pressures and purposes.

STEAM TRAPS

MOREHEAD MANUFACTURING CO.

DETROIT, MICH.

Return, Non-Return Vacuum and Condenser Steam Traps. The Morehead Tilting Steam Trap is the original design of *tilting* trap, having been on the market for a quarter of a century. For reliable and satisfactory service this type of trap recommends itself. Illustrated descriptive catalog sent on request.

THE MURPHY IRON WORKS

DETROIT, MICH.

Founded 1878 Inc. 1904

Builders of The Murphy Automatic Furnace. The best Automatic Furnace that thirty years practical experience can produce.

AUTOMATIC FURNACE

NELSON VALVE COMPANY

PHILADELPHIA

Gate, Globe, Angle and Check Valves, for Water, Saturated or Superheated Steam and other fluids, for any pressure, for any temperature; also Blow-off Valves. Catalogues and information on request.

VALVES

THE PICKERING GOVERNOR CO.

PORTLAND, CONN.

Governors for Steam Engines, Turbines, Gas Engines. Mechanical Control Power Regulation.

See Page 111 of Condensed Catalogues of Mechanical Equipment.

GOVERNORS

POWER PLANT SPECIALTY COMPANY

625 Monadnock Blk., CHICAGO, ILL.

Manufacturers of the Vater Two Stage Separator, Vater Water Softening System, Vater Open Feed Water Heater, Monarch Vacuum Drain Trap, Pressure and Gravity Filters. Correspondence solicited.

SEPARATORS
FEED-WATER HEATERS
SOFTENERS

POWER SPECIALTY CO.

111 Broadway NEW YORK

The Foster Patent Superheater, saves feed water, condensing water, coal and boiler power.

SUPERHEATERS

WM. B. SCAIFE & SONS COMPANY

221 First Ave., PITTSBURG, PA.

WE-FU-GO and SCAIFE Water Softening, Purifying and Filtering Systems for boiler feed water and all industrial and domestic purposes.

WATER SOFTENING PURIFYING and FILTERING SYSTEMS

SCHUTTE & KOERTING CO.

1229-57 N. 12th St. PHILADELPHIA, PA.

Injectors, Syphons, Eductors, Furnace Blowers, Exhausters, Pump Primers, Condensers, Spray Cooling Nozzles; Valves; Small Brass and Iron Body, Open Hearth Steel-Stop, Stop Check, Emergency Stop Check, Trip, Throttle Trip, Engine Stops, Steam Traps, Feed Water Heaters, etc.

INJECTORS
CONDENSERS
VALVES
ENGINE STOPS

SHERWOOD MANUFACTURING CO.

BUFFALO, N. Y.

Twenty-five years' experience manufacturing the Sherwood Double Tube Injectors for high duty; Buffalo Automatic Injectors; also makers of the Hart Force Feed Oil Pump for Steam Engines; Buffalo Force Feed Multiple Oil Pumps for Gas and Gasoline Engines; Oil Cups, etc. Catalog on application.

INJECTORS AND OIL PUMPS

INSTRUMENTS

C. J. TAGLIABUE MFG. CO.

396–398 BROADWAY NEW YORK, N. Y.

Local Sales Offices in Chicago and San Francisco

Manufacturers of Instruments for Indicating, Recording and Controlling Temperature and Pressure. Thermometers; Automatic Controllers; Gages; Oil Testing Instruments; Engineers' Testing Sets, Pyrometers, Barometers, Hygrometers, Hydrometers, etc.

See our Condensed Catalogue in April 1911 number of The Journal.

LUBRICATING OILS

THE TEXAS COMPANY

NEW YORK HOUSTON

Lubricating Oils for Power Plants, Central Stations, Machine Shops, Foundries and all general purposes. All classes of Petroleum Products of the highest quality.

CONDENSERS
PUMPS
COOLING TOWERS

WHEELER CONDENSER & ENG. CO.

MAIN OFFICE AND WORKS: CARTERET, N. J.

Surface, Jet and Barometric Condensers, Combined Surface Condensers and Feed Water Heaters, Cooling Towers, Edwards Air Pumps, Centrifugal Pumps, Rotative Dry Vacuum Pumps and Multiple Effect and Evaporating Machinery.

CONDENSERS
COOLING TOWERS
FEED-WATER HEATERS

C. H. WHEELER MFG. CO.

PHILADELPHIA, PA.

NEW YORK BOSTON CHICAGO SAN FRANCISCO

Manufacturers of High Vacuum Apparatus, Condensers, Air Pumps, Feed-Water Heaters, Water Cooling Towers, Boiler Feed and Pressure Pumps.

PUMPS AND HYDRAULIC TURBINES

HYDRAULIC TURBINES
PUMPING MACHINERY

ALLIS-CHALMERS COMPANY

MILWAUKEE, WISCONSIN

Builders of Reaction and Impulse Turbines, in capacities up to 20,000 H.P. High Duty Pumping Engines, Centrifugal Pumps, Single and Multi-Stage; Screw Pumps, Elevator Pumps, Geared Pumps, Mine Pumps and Electrically Driven Pumps. Hydraulic Transmission Pumping Machinery.

PUMPING MACHINERY

AMERICAN STEAM PUMP COMPANY

BATTLE CREEK, MICHIGAN, U. S. A.

Manufacturers of Marsh and American Steam and Power Pumping Machinery. The valve motion is designed for efficient and reliable service, which, combined with low maintenance cost, should appeal to engineers who desire to reduce their operating expenses. Literature upon request.

PUMPS
CONDENSERS

M. T. DAVIDSON CO.

43–53 KEAP ST., BROOKLYN, N. Y.

NEW YORK: 154 Nassau St. BOSTON: 30 Oliver St.

High grade economical Pumps for all services. Surface and Jet Condensers.

THE GOULDS MANUFACTURING COMPANY

SENECA FALLS, N. Y.

Manufacturers of Efficient Triplex Power Pumps for general water supply, municipal water-works, fire protection, hydraulic elevators, paper and pulp mills, boiler feed pumps, chemical pumps and air compressors, rotary, centrifugal and well pumps and hand pumps of every kind.

PUMPS
HYDRAULIC MACHINERY

HOLYOKE MACHINE COMPANY

HOLYOKE, MASS. WORCESTER, MASS.

Water Wheels with Connections and Complete Power Transmission, Water Wheel Governors, Gearing, Wood Pulp and Paper Machinery, Pumps, Hydraulic Presses. Special Machinery to order.

WATER WHEELS
WOOD PULP AND PAPER MACHINERY

J. & W. JOLLY, Inc.

HOLYOKE, MASS.

McCormick Holyoke Turbines designed to suit Mill or Hydro-Electric Work. Paper Mill Machinery, Shafting, Gearing, Pulleys and Freight Elevators.

TURBINES
PAPER MILL MACHINERY

MORRIS MACHINE WORKS

BALDWINSVILLE, N. Y.

Manufacturers of Centrifugal Pumping Machinery, Vertical and Horizontal Engines and Marine Engines.

CENTRIFUGAL PUMPING MACHINERY
ENGINES

POWER TRANSMISSION

THE AMERICAN PULLEY CO.

PHILADELPHIA, PA.

The American Pulley. The first all steel parting belt pulley made. Now sold in larger quantities than any one make of pulley. No key, no set screw, no slip; light, true and amply strong for double belts. 120 stocks carried in the United States.

PULLEYS

ONEIDA STEEL PULLEY CO.

ONEIDA, N. Y. CHICAGO, ILL.

The largest manufacturers of Pulleys in the world. Our Steel Pulleys range from 6 to 126″ diameter, 3 to 40 face, and fit any size shaft from 1 to $8\frac{1}{2}$″. Let us send you our booklet illustrating all styles.

PULLEYS

THE A. & F. BROWN CO.

172 Fulton St. NEW YORK

Manufacturers of Shafting, Pulleys, Hangers, etc., for Transmission of Power.

SHAFTING
PULLEYS
HANGERS

FRICTION CLUTCHES

THE CARLYLE JOHNSON MACHINE CO.

MANCHESTER, CONN.

Send for our Catalog, and Clutch Booklet entitled "Clutches for Use in Machine Building." The information set forth therein will be of interest to any Builder or Designer of Machinery.

POWER TRANSMISSION ELEVATORS CONVEYORS

DODGE MANUFACTURING CO.

MISHAWAKA, IND.

Manufacturers of everything for the Mechanical Transmission of Power; also Elevating and Conveying Machinery, and the "Eureka" Water Softener. Send for general catalog C–10.

POWER TRANSMISSION APPLIANCES

FALLS CLUTCH & MACHINERY CO.

CUYAHOGA FALLS, OHIO

Friction Clutch Pulleys, Couplings, Quills, Operators, Clutch Sheaves, Floor Stands, Heavy Mill Bearings, Shaft Couplings, Sheaves and Tension Carriages, Pulleys and Fly Wheels.

STEEL BELT LACING

FLEXIBLE STEEL LACING CO.

542 W. Jackson Boulevard CHICAGO, ILL.

Alligator Steel Belt Lacing. Adapted for use on leather, rubber, balata, cotton or canvas-stitched belting of any width or thickness. A perfect flexible joint and separable hinge joint that works satisfactorily with an idler.

POWER TRANSMISSION

THE HILL CLUTCH COMPANY

CLEVELAND, OHIO

Manufacturers of a complete line of Power Transmission Machinery for belt, rope or gear driving, including the well known Hill Friction Clutches and Hill Collar Oiling Bearings.

PULLEYS—PAPER FRICTION TRANSMISSION

THE ROCKWOOD MANUFACTURING CO.

INDIANAPOLIS, IND.

Rockwood Paper Frictions have proven their unquestioned superiority. You will find our booklets regarding Transmission of Power by Belts and Friction Transmission desirable additions to your engineering library.

POWER TRANSMISSION

T. B. WOOD'S SONS CO.

CHAMBERSBURG, PA.

Modern and Approved Appliances for the transmission of Power. Shafting, Couplings, Collars, Hangers, Pulleys, Belt Tighteners, Friction Clutches, Rope Driving Equipments.

PAPERS ON POWER TRANSMISSION

PAPERS FROM TRANSACTIONS OF A. S. M. E.

No. 585. Power Losses in Transmission Machinery of Central Stations: Aldrich, price $.20; No. 808. Power Transmission by Belt: F. L. Emory, price $.10; No. 1180. Power Transmission by Friction Drives: W. F. M. Goss, price $.30; No. 1230. Paper on Belting: C. G. Barth, price $.50.

HOISTING AND CONVEYING MACHINERY

ALLIANCE MACHINE CO.

ALLIANCE, OHIO

Makers of Alliance Cranes of all types; also Rolling Mill and Hydraulic Machinery, Steam Hammers, Punches and Shears, Scale Cars, Copper-Converting Machinery, etc.

CRANES
STEAM HAMMERS
PUNCHES AND SHEARS

THE BROWN HOISTING MACHINERY CO.

New York CLEVELAND, O., U. S. A. Pittsburg

Designers and manufacturers of all kinds of Hoisting Machinery, including Locomotive Cranes. Electric Travelers, I-beam Trolleys, Crabs, Winches, etc., as well as heavy Hoisting Machinery of all descriptions. Also Ferroinclave for reinforced concrete roofing.

HOISTING MACHINERY

H. W. CALDWELL & SON COMPANY

NEW YORK CHICAGO

Elevating, Conveying and Power Transmitting Machinery. Helicoid and screw conveyors, machine molded gears, pulleys, fly-wheels, rope sheaves and drives, sprocket wheels and chain, buckets, belting, shafting and bearings.

CONVEYORS
ELEVATORS
POWER TRANSMISSION

CLYDE IRON WORKS

DULUTH, MINN.

Hoisting Engines and Derricks. All sizes and types of engines.

HOISTING ENGINES AND DERRICKS

THE EASTERN MACHINERY COMPANY

NEW HAVEN, CONN.

Manufacturers of Electric and Belt Power Passenger and Freight Elevators, Hoisting Machines, Friction Winding Drums, Friction Clutches and Friction Clutch Pulleys.

ELEVATORS
FRICTION CLUTCHES
PULLEYS

THE B. F. GOODRICH CO.

AKRON, OHIO

Manufacturers of Goodrich Conveyor Belt. The Goodrich "Longlife" "Maxecon" and "Grainbelt" Conveyors will handle more tons per dollar of cost than any other belt made.

CONVEYOR BELTS

THE JEFFREY MFG. COMPANY

COLUMBUS, OHIO

Builders of Elevating, Conveying and Mining Machinery; Coal and Ashes Handling Systems for Power Plants; Screens, Crushers, Pulverizers, Car Hauls, Coal Tipples, Coal Washeries, Locomotives, Coal Cutters, Drills, etc. Complete Coal Mine Equipments.

ELEVATING CONVEYING MINING MACHINERY

HOISTING ENGINES
CABLEWAYS
MARINE TRANSFERS

LIDGERWOOD MFG. CO.

96 LIBERTY ST. NEW YORK

Hoisting Engines—steam and electric, for every use of the contractor, miner, warehouseman, railroads, shipowners, etc. Derricks, Derrick Irons and Derrick Hoists, Cableways for hoisting and conveying, Marine Transfer for coal and cargo handling.

ELEVATORS AND CONVEYORS

LINK-BELT COMPANY

PHILADELPHIA CHICAGO INDIANAPOLIS

Elevators and Conveyors for every purpose; all accessories; Power Transmission Machinery.

ELEVATING AND CONVEYING MACHINERY

MEAD-MORRISON MANUFACTURING CO.

NEW YORK BOSTON CHICAGO

Coal-Handling Machinery, Hoisting Engines, complete Discharging and Storage Plants Cable Railways, Marine Elevators, McCaslin and Harrison Conveyors, Steam, Electric, Belt and Gasoline Hoists, Derrick Swingers, Grab Buckets, Steam Boilers, Locomotive Derricks, Suspension Cableways.

CRANES

THE MORGAN ENGINEERING CO.

ALLIANCE, OHIO

Are the largest builders of Electric Traveling Cranes in the world. We also design and build Steel Plants complete, Hammers, Presses, Shears, Charging Machines and all kinds of Rolling Mill and Special Machinery.

ELEVATORS

THE H. J. REEDY CO.

CINCINNATI, O.

Manufacturers of all types of Passenger and Freight Elevators.

ROBINS BELT CONVEYORS

ROBINS CONVEYING BELT COMPANY

THOMAS ROBINS, Pres. C. KEMBLE BALDWIN, Chief Engr., 13 Park Row, N.Y.

The Robins Belt Conveyor was the original and is today the standard of this type of conveying machinery. It is successfully and economically conveying ore, rock, coal and similar materials under the most trying conditions of service. Correspondence invited.

WIRE ROPE

JOHN A. ROEBLING'S SONS COMPANY

TRENTON, N. J.

Manufacturers of Iron, Steel and Copper Wire Rope, and Wire of every description.

CRANES
MONO-RAIL SYSTEMS
CONTROLLERS

SHAW ELECTRIC CRANE CO.

MUSKEGON, MICH.

Electric Travelers for all purposes. Gantries. Wharf Cranes. Railroad Wrecking Cranes. Mono-Rail Systems. Electric Motor Controllers.

THE TOLEDO BRIDGE & CRANE CO.

TOLEDO, OHIO

Toledo Cranes and Hoists; Coal and Ore Handling Bridges; Grab Bucket Machinery; Electric and Hand Power Cranes, all types, any capacity; Structural Steel for Factory Buildings.

CRANES
HOISTS

THE WEBSTER M'F'G COMPANY

(Successors to WEBSTER M'F'G CO.)

TIFFIN, OHIO — Eastern Branch: 88-90 Reade St., NEW YORK

Manufacturers of Elevating, Conveying and Power Transmitting Machinery for all purposes. Over thirty years' experience in this line and extensive facilities for manufacturing give us large advantages. Belt Conveyors for handling cements, ores, sand, gravel, etc. Coal and Ash Handling Systems for power plants and buildings. Chain belting. Gearing.

ELEVATING
CONVEYING
POWER
TRANSMITTING
MACHINERY

THE YALE & TOWNE MFG. CO.

9 MURRAY ST. — NEW YORK

Makers of the Triplex Block and Electric Hoists. The Triplex Block is made in 14 sizes, with a lifting capacity of from $\frac{1}{4}$ to 20 tons; Electric Hoist in 10 sizes, $\frac{1}{4}$ to 16 tons.

CHAIN
BLOCKS
ELECTRIC
HOISTS

ELECTRICAL APPARATUS

ALLIS-CHALMERS COMPANY

MILWAUKEE, WISCONSIN

Builders of Electrical Machinery of every description; Motors and Generators for alternating and direct current; Rotary Converters, Transformers, Switchboards.

MOTORS
AND
GENERATORS

GENERAL ELECTRIC COMPANY

SCHENECTADY, N. Y.

Generators, motors, Curtis steam turbines, switchboards, transformers, locomotives, lighting equipments, air compressors, electrically heated devices for industrial purposes. Largest manufacturer of electrical apparatus in the world.

ELECTRIC
DRIVE

WAGNER ELECTRIC MFG. COMPANY

SAINT LOUIS, MO.

Producers of the commercially successful Single-phase Motor. Pioneers in Power and Lighting Transformers. Builders of the most liberally designed and rugged polyphase generators and motors the market affords. Manufacturers of the most comprehensive line of switchboard and portable instruments offered to-day.

DYNAMOS
MOTORS
TRANSFORMERS
INSTRUMENTS

WESTINGHOUSE ELECTRIC & MFG. CO.

PITTSBURG, PA.

Westinghouse Electric Motor Drive. Pumps, compressors, hoists, machine tools and every class of apparatus develop their highest efficiency when individually driven with Westinghouse Motors.

ELECTRIC
MOTOR
DRIVE

AIR COMPRESSORS AND PNEUMATIC TOOLS

AIR COMPRESSORS
PNEUMATIC TOOLS

CHICAGO PNEUMATIC TOOL CO.

CHICAGO, ILL.

Manufacturers of "Chicago Pneumatic" Air Compressors and a complete line of Pneumatic Tools and Appliances.

AIR COMPRESSORS
TOOLS
HOISTS AND
SAND
RAMMERS

INGERSOLL-RAND COMPANY

11 BROADWAY NEW YORK

Twenty standard Air Compressor types, capacity 8 to 8000 cu. ft. per minute; "Crown" and "Imperial" Hammers and Drills, all sizes; "Imperial" Air Motor Hoists, ½ to 5 tons capacity; "Crown" Sand Rammers, floor and bench types.

FOUNDRY EQUIPMENT

SAND
RAMMERS
AIR TOOLS
AND HOISTS
COMPRESSORS

INGERSOLL-RAND COMPANY

11 BROADWAY NEW YORK

'Crown" Sand Rammers, floor and bench types; "Crown" and "Imperial" Chipping Hammers; "Imperial" Air Motor Hoists, ½ to 5 tons capacity; Air Compressors, twenty types, capacity 8 to 8000 cu. ft. per minute.

FOUNDRY
MOLDING
MACHINE
EQUIPMENT

MUMFORD MOLDING MACHINE CO.

30 Church St., New York — 2014 Fisher Bldg., Chicago, Ill.

Plain Power Squeezing Machines
Jolt Ramming Machines
Split Pattern Vibrator Machines
Pneumatic Vibrators

FOUNDRY
EQUIPMENT

J. W. PAXSON CO.

PIER 45 NORTH PHILADELPHIA, PA.

Manufacturers and engineers. Complete Foundry Equipment. Cupolas, Blowers, Sand Blast Machinery, Cranes, Tramrail Systems. Foundry Buildings designed, Foundry Sand, etc.

FOUNDRY
PLANT
EQUIPMENT

WHITING FOUNDRY EQUIPMENT CO.

HARVEY, ILL.

Manufacturers, Engineers and Designers of complete equipment for grey iron, brass, car wheel, pipe, steel and malleable foundry plants, and Cranes of all kinds for every service. Buildings designed and furnished; equipment installed and operated.

BLOWERS, FANS, DRYERS, ETC.

P. H. & F. M. ROOTS CO.

CONNERSVILLE, IND.

Positive Pressure Blowers for foundries. High Pressure Blowers. Blowers for vacuum cleaning, for laundries, for blacksmiths. Positive Rotary Pumps. Positive Pressure Gas Exhausters. High Pressure Gas Pumps. Flexible Couplings.

BLOWERS
GAS EXHAUSTERS
PUMPS

RUGGLES-COLES ENGINEERING CO.

McCORMICK BLDG., CHICAGO HUDSON TERMINAL, NEW YORK

Dryers. Direct heat, Indirect heat, and Steam Dryers for all kinds of materials.

DRYERS

B. F. STURTEVANT COMPANY

HYDE PARK, MASS.

We make equipment to force or exhaust air under all conditions. Largest standard line of "ready to deliver" Fans in the world and special work done where necessary. Consulting representatives in or near your city.

FANS
BLOWERS
ECONOMIZERS
ENGINES

ROLLING MILL MACHINERY

MACKINTOSH HEMPHILL & CO.

PITTSBURGH, PA.

Engines, single and compound, corliss reversing and blowing. Rolling Mill and Hydraulic Machinery of all kinds. Shears, Punches, Saws, Coping Machines.

ENGINES
ROLLING MILL MACHINERY

UNITED ENGINEERING & FOUNDRY CO.

2300 Farmers' Bank Bldg. PITTSBURG, PA.

Manufacturers of High-Speed Steam Hydraulic Forging Presses, Single Lever Control. Built for all classes of Forging, Shearing or Pressing. 100 to 12,000 tons capacity.

STEAM HYDRAULIC FORGING PRESSES

PAPERS FROM TRANSACTIONS OF A. S. M. E.

No. 824. New System of Valves for Steam Engines, Air Engines and Compressors: F. W. Gordon, price $.20; No. 894. Test of an Hydraulic Air Compressor: W. O. Webber, price $.10; No. 1017. Improvement in Valve Motion of Duplex Air Compressors: S. H. Bunnell, price $.10; No. 1131. A High Duty Air Compressor: O. P. Hood, price $.30.

PAPERS ON AIR COMPRESSORS

ENGINEERING MISCELLANY

ALUMINUM

ALUMINUM COMPANY OF AMERICA

PITTSBURGH, PA.

Aluminum Ingot, Sheet, Rod, Wire, Cable, Tubing and other forms.

BALL BEARINGS

AUBURN BALL BEARING COMPANY

22 ELIZABETH ST. ROCHESTER, N. Y.

Auburn Four Point Contact Cone Principle Ball Thrust Bearings, Auburn Steel, Brass and Bronze Balls, Solid and Hollow.

CASTINGS
MACHINE WORK
GRINDING MACHINES

BUILDERS IRON FOUNDRY

PROVIDENCE, R. I.

Engineers, Founders and Machinists

Castings of Unusual Size, Weight and Strength. Large and Accurate Machine Work. Grinding and Polishing Machines.

WATER FILTERS

ROBERTS FILTER MFG. CO., Inc.

DARBY, PHILADELPHIA, PA.

Designers and Builders of Water Filters of both the Pressure and Gravity types, of any capacity.

BALL AND ROLLER BEARINGS

STANDARD ROLLER BEARING COMPANY

50th St. and Lancaster Ave. PHILADELPHIA, PA.

Largest manufacturers in the world of Ball and Roller Bearings for all purposes. Steel, Bronze and Brass Balls.

BRIGHT COLD FINISHED STEEL BARS

UNION DRAWN STEEL CO.

BEAVER FALLS, PA.

Makers of Bright Cold Finished Bessemer, Open Hearth Crucible and Alloy Steels, in Rounds, Flats, Squares, Hexagons and Special Shapes.

PLANERS

S. A. WOODS MACHINE CO.

BOSTON

CHICAGO-NORFOLK
NEW ORLEANS-SEATTLE

The Planer Specialists Planers for Dressing Lumber

CONDENSED CATALOGUES OF MECHANICAL EQUIPMENT

SECTION ONE (PART TWO)

Power Plant Equipment

Other sections of the Condensed Catalogues to be published in subsequent issues of The Journal during 1912 will include Hoisting, Elevating and Conveying Machinery, Industrial Railway Equipment, Power Transmission Machinery, Electrical Equipment, Metal Working Machinery, Machine Shop and Foundry Equipment, Steel and Rolling Mill Equipment, Pumping Machinery, Mining and Metallurgical Equipment, Heating and Ventilating Apparatus, Refrigerating Machinery, Air Compressors and Pneumatic Tools, Engineering Miscellany.

At the close of the year the entire collection of Condensed Catalogues will be reprinted in volume form and distributed to members without charge.

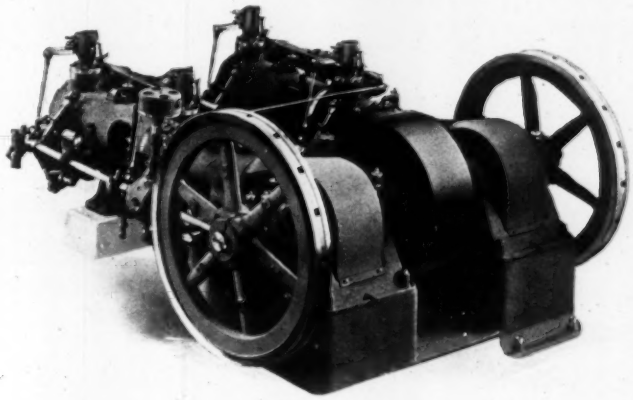
THE AMERICAN SOCIETY *of* MECHANICAL ENGINEERS

THE ELYRIA GAS POWER CO.

ELYRIA, OHIO

GAS ENGINES

Builders of "The Little Big Engine"



FEATURES OF "THE LITTLE BIG ENGINE"

Uses Producer, Natural and City Gas, Gasoline and Distillate.

Only change necessary in change of fuel is length of connecting rod for altering compression and exchange of fuel handling devices.

Economy ranges from 10,000 to 12,000 BTU, depending on size.

All sizes with water-cooled exhaust valves; all but No. 2 have water-cooled pistons and piston rod. No water joints subject to explosion pressures.

Governs by varying lift of inlet valves. Good regulation.

Pulley or flexible coupling bolted to flywheel, either side.

Ignition make-and-break or jump spark, both for continuous service.

Our "Show-me" guarantee means much to the buyer. Get it.

Crank Shaft half of cylinder bores. Main bearings removable bushings.

Automatic Air Starting Equipment always included.

Gas Producers and Dynamos furnished. Quick delivery a feature.

Engineers can safely use for estimate figures $80 per H. P. in smallest to $60 per H.P. in largest sizes. This includes engine and anthracite producer, delivered and fully installed above foundations.

We deal with purchasers or Engineers only. We have no Agents.

APPROXIMATE RATINGS AND FLOOR SPACE

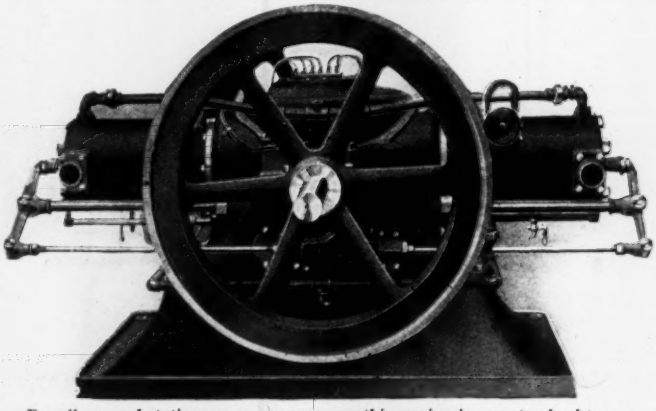
Fuel	Compression	Engine No. 2		Engine No. 3		We twin the No. 4 and No. 5			
						Engine No. 4		Engine No. 5	
						When twinned, double rating, same speeds.			
		H.P.	R.P.M.	H.P.	R.P.M.	H.P.	R.P.M.	H.P.	R.P.M.
Natural Gas	140 lbs.	40 30	325 250	60 45	290 220	75 60	275 225	110 85	260 200
City Gas	125 lbs.	40 30	325 250	60 45	290 220	75 60	275 225	110 85	260 200
Gasoline or Distillate	75 lbs. to 100 lbs.	35 30	325 275	55 45	290 240	70 60	275 235	100 85	260 220
Gasoline or Distillate with Water	100 lbs. to 125 lbs.	40	325	65	290	80	275	120	260
Producer Gas	160 lbs. to 180 lbs.	30 25	325 275	45	290	55	275	85	260
Over all space		5′-0″x10′-0″		11′-6″x5′-7″		12′-6″x6′-0″ Twinned 12′-6″x11′-6″		14′-0″x6′-10″ Twinned 14′-0″x13′-6″	

THE HEER ENGINE COMPANY

PORTSMOUTH, OHIO

HIGH GRADE GAS AND GASOLINE ENGINES

Stationary, Portable and Traction



For all general stationary power purposes this engine is our standard type, adapted to mills, factories, workshops, mines, electric lighting plants, and in fact, any place where absolutely steady and reliable power is required.

THE HEER TWO CYLINDER OPPOSED ENGINE

When it is desired to develop power in units of from 5 to 100 H. P. the two cylinder opposed type of gas or gasoline engine gives better satisfaction at less expense for room, fuel, and attendance than any other prime mover.

The Two Cylinder Opposed requires no excess weight to hold it in place—its perfect balance and evenness of construction retains its equilibrium and requires absolutely no re-adjustment when moved to another location. In the elimination of vibration there is naturally a saving of its energy, thus developing greater power at a lesser cost.

Another very important feature and advantage of the Two Cylinder Opposed is the securing of practically two engines in one or an emergency plant in case one cylinder gets out of order or needs repairing for any cause; it can be disconnected instantly without loss of time and the engine will run indefinitely on one cylinder. This is a very valuable feature which any user of power will appreciate.

CONSTRUCTIONAL FEATURES

Four Cycle Operation conceded most economical of fuel.

Mixer or *Carburetor* a combination, if desired can be used for gas or gasoline, and changed from either fuel to the other without stopping the engine.

Fuel may be natural or manufactured gas, gasoline, California distillate, kerosene, solar oil, or Oklahoma distillate.

Ignition is Jump Spark, the simplest and most reliable.

Speed is controlled by governor and can be changed as desired.

Power and *Test*. A brake test is given each engine, and all engines are rated at less than their brake horse power.

DIMENSIONS OF STATIONARY TYPES

Size of Engine in Rated Horse Power	10 H. P.	16 H. P.	25 H. P.	40 H. P.
Bore of Cylinder	5″	6″	7″	9″
Stroke	5	6	7	10
Diameter of Crank Shaft in Pins and Bearings	2	$2\frac{3}{8}$	$2\frac{3}{4}$	4
Crank Shaft Extended on One End for Pulley	6	8	10	12
Full Length of Crank Shaft Regular	$31\frac{1}{8}$	$37\frac{1}{8}$	$43\frac{1}{8}$	$57\frac{3}{8}$
Full Length of Crank Shaft Extended both ends	$36\frac{5}{8}$	$44\frac{5}{8}$	$52\frac{5}{8}$	$68\frac{7}{8}$
Length of Base at Bottom	40	$46\frac{3}{4}$	$53\frac{1}{2}$	66
Width of Base at Bottom	20	23	26	34
Length of Engine over all	$50\frac{7}{8}$	$59\frac{7}{8}$	$68\frac{3}{4}$	$99\frac{1}{2}$
Width of Engine over all Regular	$31\frac{1}{8}$	$37\frac{1}{8}$	$43\frac{1}{8}$	$57\frac{1}{8}$
Diameter of Fly Wheels	26	$30\frac{1}{2}$	35	48
Pulley any size up to (Larger Size Extra)	14	16	24	30
Revolutions per Minute (Normal)	600	500	450	350
Total Weight of Complete Engine	800	1300	2200	5200
Style Number	20	21	22	23

Write for Catalogue.

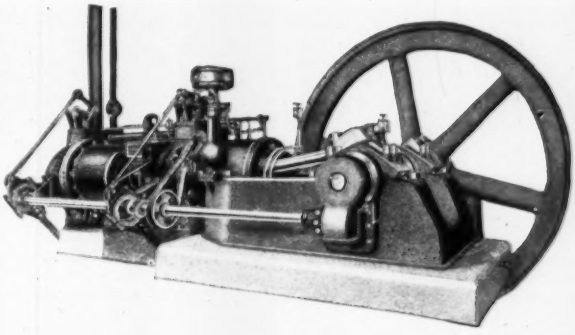
THE ST. MARYS MACHINE CO.

ST. MARYS, OHIO

OIL ENGINES AND SUCTION GAS PRODUCERS; HEAVY-DUTY TANDEM ENGINES; SINGLE-CYLINDER SOLAR OIL AND DISTILLATE ENGINES; PORTABLE ENGINES; TRACTION ENGINES. ENGINES FOR EVERY POWER PURPOSE.

HEAVY-DUTY TANDEM GAS ENGINE

Maximum Size 480 h.p.

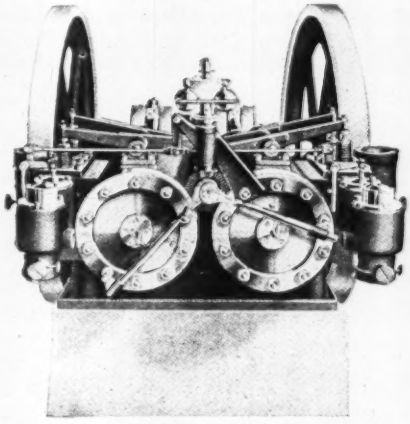


This engine operates on the four-stroke cycle. There are two cylinders arranged tandem, each having one single-acting piston. The two pistons are connected by a water-cooled piston rod, the front piston serving as a crosshead carrying the wrist pin, and but one connecting rod and crank is necessary as the pistons move together. This engine lends itself to various combinations for increasing the power of a plant.

DUPLEX SOLAR OIL ENGINES

50 h.p. up to 150 h.p.

This engine is designed for use with natural gas, city gas, gasoline, distillate, solar and crude oils, and is of the throttle-controlled type. An impulse is obtained at each revolution, resulting in greater steadiness.



The regulating device on these engines consists in vertical balanced valves which are moved by the governor and actuated by levers. The air and gas valve areas are proportioned to supply gas and air in the proper proportions to form an inflammable mixture of constant quality in any quantity that the governor may demand.

The lay shaft, igniter, eccentric, governor and pump are common to both cylinders. Each cylinder has its own regular mixing chamber attached directly to throttling chamber, doing away with long intake pipes that cause a governor to operate so sluggishly. This insures the correct amount of mixture in both cylinders, and at no time is the explosion greater in one cylinder than in the other or than the horse power required, hence a steady power.

SINGLE-CYLINDER SOLAR OIL ENGINES

10 h.p. up to 90 h.p.

These engines operate on the four-cycle plan and are designed to embody every feature calculated to insure the greatest strength and symmetrical appearance of the engine.

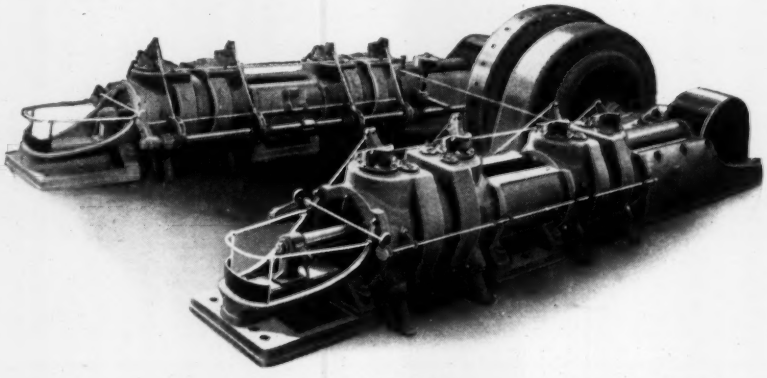
THE WISCONSIN ENGINE CO.

CORLISS, WISCONSIN

COMPLETE PLANTS

GAS OIL STEAM

ADAMS WISCONSIN GAS ENGINES. ADAMS WISCONSIN KEROSENE GAS ENGINES. WISCONSIN HIGHER SPEED CORLISS ENGINES. PRODUCERS TO FIT THE FUEL: ANTHRACITE, BITUMINOUS, LIGNITE, OIL PRODUCERS.



1500 KW Unit

ADAMS WISCONSIN GAS ENGINE:

Standard Sizes 150 KW to 1500 KW.

Simple, reliable and suited to any gas.

With these engines we furnish "Producers to fit the Fuel."

WISCONSIN ANTHRACITE PRODUCER:

An up-draft producer with angle of repose grates, adapted to economical use of smaller sizes of anthracite fuel.

WISCONSIN BITUMINOUS PRODUCER:

A down-draft producer with water seal base, automatically stoked with compressed mixture, makes no tar, can be operated continuously.

WISCONSIN LIGNITE PRODUCER:

An up-draft producer with angle of repose grates. Special arrangements to utilize the lighter lignite tars.

WISCONSIN OIL PRODUCER:

A down-draft producer forming a clean fixed gas from lowest grade crude or fuel oils; forms a low hydrogen gas, free from tar.

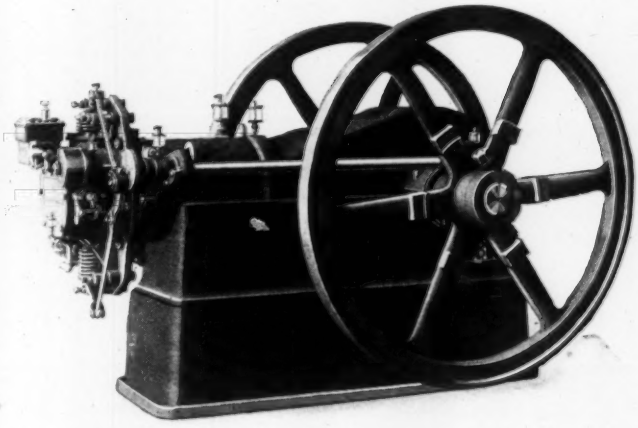
THE WISCONSIN ENGINE CO.

CORLISS, WISCONSIN

COMPLETE PLANTS

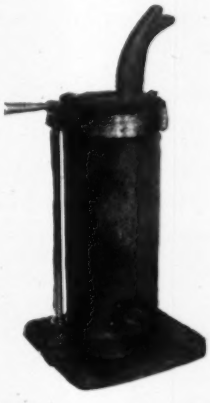
GAS OIL STEAM

ADAMS WISCONSIN GAS ENGINES. ADAMS WISCONSIN KEROSENE GAS ENGINES. WISCONSIN HIGHER SPEED CORLISS ENGINES. PRODUCERS TO FIT THE FUEL: ANTHRACITE, BITUMINOUS, LIGNITE, OIL PRODUCERS.



ADAMS-WISCONSIN KEROSENE GAS ENGINE

Capacity 50 BHP to 200 BHP. Built under Rumely patents. Gasifies and uses kerosene, gas oil, naphtha or gasoline. All these oils are gasified in a cold carburetor exactly as gasoline is gasified. 200,000 HP now in use.



WISCONSIN HIGHER SPEED CORLISS ENGINE

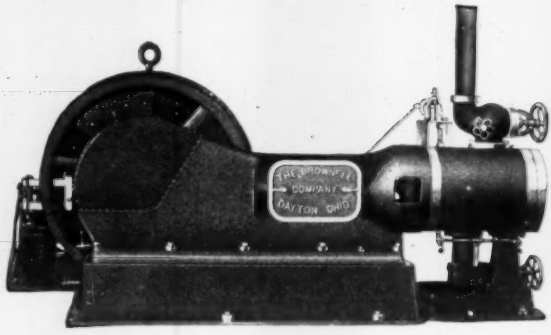
A heavy duty engine, built in capacities 100 HP to 12,000 HP, for all purposes. Highest efficiency for those who demand the best. Bulletin C-4 tells the details.

The Badger Engine Jack turns an engine over. Uses steam or compressed air. Get the story—Ask for Bulletin C-5.

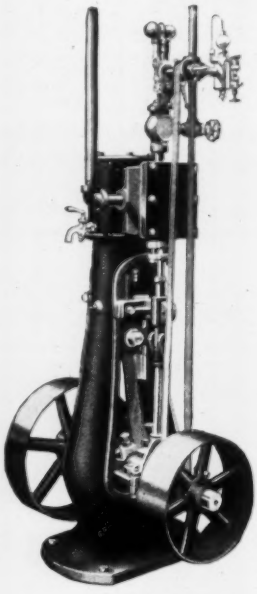
THE BROWNELL CO.

DAYTON, OHIO

ENGINES, BOILERS, FEED WATER HEATERS AND TANKS



SIMPLE AND COMPOUND ENGINES
PLAIN SLIDE VALVE AND AUTOMATIC
BELTED OR DIRECT CONNECTED
OF ALL SIZES AND FOR ALL PURPOSES



"DAYTON" VERTICAL STEAM ENGINES
for Simplicity and Small Floor Space.

Carried in Stock:

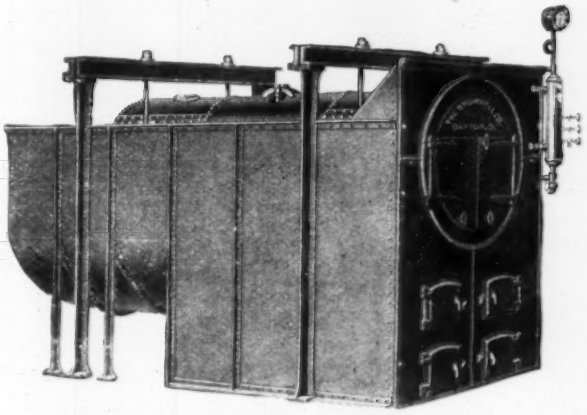
From	$3\frac{1}{2} \times 4$	2 H.P.
To	$7\frac{1}{2} \times 8$	16 H.P.

This engine is furnished separately or combined with our Vertical boiler on one solid base. The combined outfit makes an ideal self-contained power plant and cannot be equalled for compactness, simplicity and ease of operation.

Our Data Bulletin No. D-112 will be useful to you, and will be mailed upon request to Managers, Superintendents and Engineers.

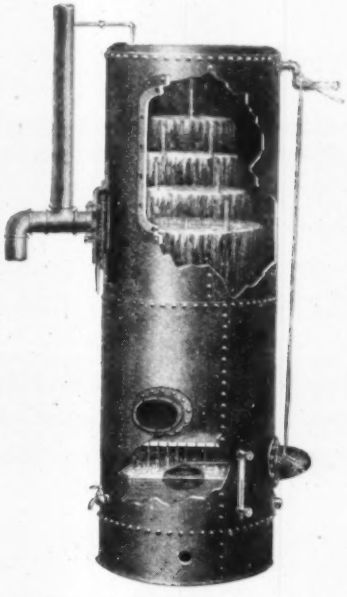
THE BROWNELL CO.

DAYTON, OHIO



BOILERS OF EVERY CLASS AND SIZE FOR ANY CONDITION OF SERVICE

All of our Boilers are built under the direct inspection of, and tested by, a special licensed boiler inspector of the Hartford Steam Boiler Inspection and Insurance Company, and will be insured for one year *free of charge*, if desired.



FEED WATER HEATERS AND LIME EXTRACTORS, OPEN AND CLOSED TYPES

Percents you save in fuel consumption by heating feed water:

Final Temperature	Initial Temperature of Water				
	32°	40°	50°	60°	70°
60°	2 39	1 71	0 86		
80	4 09	3 43	2 59	1 74	0 88
100	5 79	5 14	4 32	3 49	2 64
120	7 50	6 85	6 05	5 23	4 40
140	9 20	8 57	7 77	6 97	6 15
160	10 90	10 28	9 50	8 72	7 94
180	12 60	12 00	11 23	10 46	9 68
200	14 30	13 71	13 00	12 20	11 43

Our Data Bulletin No. D–112 will be useful to you, and will be mailed upon request to Managers, Superintendents and Engineers.

JOHN MOHR & SONS

349-359 W. Illinois St. CHICAGO, ILL.

GARBE WATER TUBE BOILER, BLAST FURNACES, STEEL LADLES, HOT STOVES, CUPOLAS, FURNACES, MIXERS, CONVERTERS, STERILIZERS, ETC.

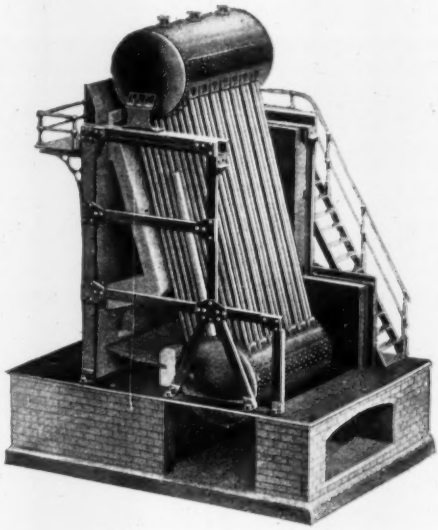
THE GARBE BOILER

Special Advantages

All handholes with their troublesome and expensive gaskets are eliminated, as the tubes are expanded into very large drums which are equipped with the patented pressed "Garbe" Plate. Any tube can easily and quickly be inserted, removed and replaced without disturbing any of the others.

Elimination of all flat surfaces, stay bolts and braces. All parts of Boiler are cylindrical and curved.

All tubes are absolutely straight and nearly vertical, therefore the entire circumference of tube is directly exposed to the gases. The effective heating surface is materially larger than that obtained by horizontal tubes.



Garbe Patent Water Tube Boiler

The upper drum is suspended from a substantial structural frame work, absolutely independent from the mason work. The lower drum is in contact with two slides or guides, thereby allowing free expansion of tubes, equalizing the strain between drums and reducing chances of leakage to a minimum.

The vertical arrangement of tubes allows the steam to develop very freely and to flow by the shortest way possible without changing direction to the upper drum, thereby causing a very rapid circulation. The tubes are distributed over the full length of the Boiler, thus giving a large and uniform steam liberating surface, equal to the full area of the tubes. This vertical arrangement of tubes will do away with local overheating and consequent rupture of the tubes so often occurring in horizontally arranged tubes.

Soot, dust and ashes cannot accumulate on tubes or any part of drum, thereby allowing longer periods of operation without the necessity of cleaning.

Large water capacity, due to the extremely large size of upper and lower drum, insuring a more constant water level than any other Boiler.

The feed water passes through the rear bank of tubes, which have the lowest temperature, to the lower drum and deposits therein all impurities.

Over half of the entire heating surface is effective in liberating steam.

Practically no scale in tubes owing to rapid circulation and vertical tubes.

Further Information on Request.

ALPHONS CUSTODIS CHIMNEY CONSTRUCTION CO.

BENNETT BUILDING, NEW YORK

Chicago, Ill., First Nat'l Bank Bldg. Atlanta, Ga., Empire Bldg. Montreal, 304 University St.
Philadelphia, Pa., Penn Mutual Bldg. Detroit, Mich., Moffat Bldg. Toronto, Stair Bldg.
Kansas City, Mo., Reliance Bldg. Boston, Mass., Oliver Bldg. Ottawa, 81 Bank St.
San Juan, Porto Rico, Belaval Bldg. Winnipeg, 445 Main St.

DESIGNERS AND BUILDERS OF RADIAL BRICK CHIMNEYS

All Sizes For All Purposes

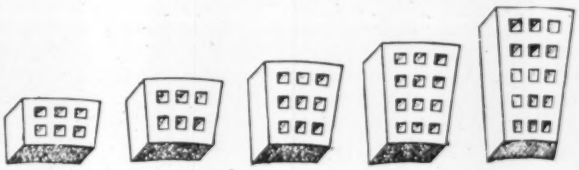
We design chimneys of all sizes and for all purposes. The boilers, the coal used, temperatures, gases generated, geographical location and many other conditions affect the determination of the most economical and efficient size of a chimney.

The ALPHONS CUSTODIS CHIMNEY CONSTRUCTION COMPANY, through its forty years of experience, is equipped to give expert advice as to the size and shape of any kind of a chimney for any purpose, as well as make recommendations through their engineers regarding boiler lay-outs, size, shape and design of flues. If you will tell us your conditions and the results you wish to accomplish, we will promptly tell you the correct, efficient and economical size of chimney, and will make recommendations to you, not from theoretical tables, but from forty years' experience and unpublished data we have collected from actual working conditions of our chimneys all over the world.

The fact that over 6000 Custodis Radial Brick Chimneys are now in successful operation is conclusive proof of their efficiency, permanency and economy.

The Tallest and Largest Chimney in the World. Weight 17,000 tons.

View of completed chimney. Boston & Montana C. C. & S. M. Co., Great Falls, Mont. 506'x50'0". Built in 1908.



The Perforated Radial Blocks are made only from the purest clays, selected for high refractory powers and high crushing strength. Special attention is given to our brickyards to make the proper mix of clays in the right proportion to produce a radial chimney which will resist heat strains as well as strains from weight and wind.

All the radial blocks are formed to suit the circular and radial lines of each part of the chimney, so that they can be laid with thin even joints and produce a regular smooth surface.

The blocks are larger than common bricks, making the number of mortar joints in a RADIAL BRICK CHIMNEY one-third of those in a common brick chimney of the same size.

Moulded with vertical perforations, as shown in the cuts above, the RADIAL BLOCKS are most thoroughly and uniformly burned, increasing, to a marked degree, their density and strength. The perforations form a dead air space around the chimney, insulating the hot column of rising gases on the inside from sudden changes of temperature of the outer air, resulting in a maximum draft under all conditions.

C. W. HUNT COMPANY

WEST NEW BRIGHTON, STATEN ISLAND, NEW YORK

New York City Office: 45 Broadway

COAL AND ASHES HANDLING MACHINERY

FOR POWER STATIONS, BOILER-ROOMS, COALING STATIONS, ETC.

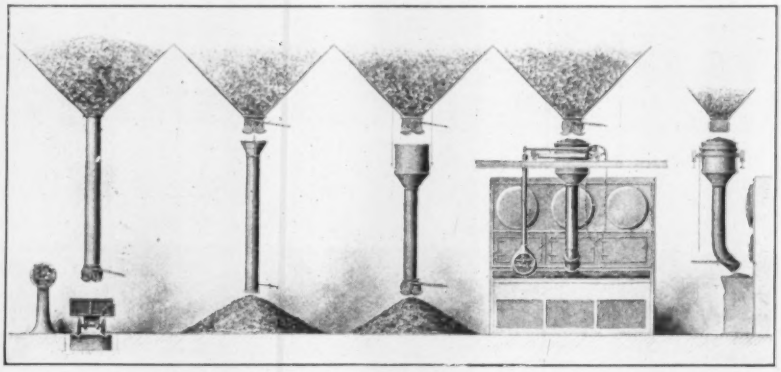
Single Door Charging Car

Tip Car for Handling Ashes

"INDUSTRIAL" RAILWAYS AND CARS

These cars are designed for bringing coal from the storage bins to boiler-rooms and retort houses. This is not only the most convenient and economical way of carrying coal to the boiler-room, but it is the least laborious in firing, as the coal is at the most convenient distance from the furnace and at the right level for ease in shoveling. The coal remains in the car until it is shoveled directly into the furnace, and the floor of the boiler-room is kept entirely free from dust and dirt, and as clean as the most fastidious could desire.

We build a great variety of narrow-gauge cars for handling materials. Full particulars will be found in our catalogue, "Industrial" Railways.



SPECIAL SCALES FOR BOILER-ROOM SERVICE

These scales are for use in boiler-rooms and manufacturing establishments where coal or other material is kept in overhead bins, from whence it can be drawn into the weighing hopper and its weight taken. The contents can then be spouted from the lower end of the hopper into the steam boiler stokers. The entire outfit—scales, hopper and spout—is suspended from a trolley that runs along an overhead track; hence the scale and apparatus can be moved from boiler to boiler; or if separate scales are installed at each boiler, they can be moved out of the way when it becomes necessary to inspect or repair the boilers. The weighing beam is brought down to a convenient height from the floor.

THE HUNT NOISELESS GRAVITY CONVEYOR

For Handling Coal and Ashes in Power Plants

The Hunt Conveyor is especially suitable for difficult installations, the construction of the chain being such that the Conveyor can make quarter turns, and can run vertical, horizontal, or inclined, the buckets hanging upright in all positions of the chain. The Conveyor is noiseless in operation, every bearing is kept thoroughly lubricated, and the entire equipment is as durable as the best machine tools.

OTHER HUNT PRODUCTS

Cable and Automatic Railways, Electric Locomotives, Hoisting and Conveying Machinery, Steeple Towers, "Stevedore" Transmission and Hoisting Rope, etc.

THE GAS MACHINERY CO.

CLEVELAND, OHIO, U. S. A.

COAL AND WATER GAS APPARATUS EXHAUSTERS, CONDENSERS, SCRUBBERS, TAR EXTRACTORS, WASHERS, PURIFIERS, VALVES, CONNECTIONS, BY-PRODUCT MACHINERY, COMPLETE GAS PLANTS.

GASMACO

Our business is so largely concerned with specific requirements of individual Gas Companies that a catalogue of our products is hardly feasible; but we issue a large number of Bulletins in which special features and various applications of our products are fully illustrated and described.

BULLETINS DESCRIBING THE FOLLOWING WILL BE SENT ON REQUEST

I. COAL-GAS, OIL-GAS, and CARBURETTED WATER-GAS PLANTS for illuminating or fuel purposes.

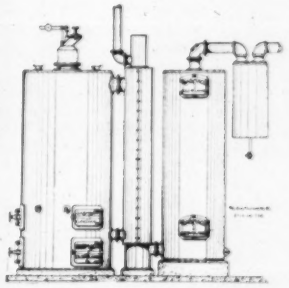
II. AMMONIA APPARATUS for making aqua-, anhydrous- or concentrated ammonia.

III. TAR STILLS.

IV. GAS VALVES "Cone Disc" all iron Double Gate Valves, Angle Valves and Gas Connections.

V. BLUE-WATER-GAS-PLANTS for welding, brazing, etc.

VI. GAS PRODUCERS for small anthracite coal, made in sizes from 35 H. P. to 300 H. P. for fuel and power purposes.



Gas Producer

VII. MUFFLE FURNACES for enameling, direct or producer-gas fired, with recuperators to save a large amount of the heat in waste gases.

VIII. BRICK KILNS, continuous tunnel kilns.

THE MODEL STOKER COMPANY

DAYTON, OHIO

THE MODEL AUTOMATIC SMOKELESS FURNACE

We manufacture exclusively the Model Automatic Smokeless Furnace. An automatic furnace for power boilers which both stokes and cleans the fire, insuring practically complete or smokeless combustion, decided economy, superior utility, durability and low cost of maintenance.

It is an advance development of the double or side feed type.

All parts are well protected against destructive heat and readily adjustable to suit requirements. Stoker engine uses only about ½ of 1% of steam made.

Any or all parts can be operated by hand. Combustion is complete in fire chamber, and there is no smoke even when heat gases pass directly from under the arch to the water surface of boiler.

The improved construction renders it the most durable and most efficient furnace in use. Requires less fuel, less labor and less cost for maintenance for any given duty. Uses successfully any soft coal of feedable size. Responds readily to any variations and will crowd a boiler quickly and strong. Adaptable to any style of boiler and to every class of duty requiring high temperatures.

Coal can be supplied by gravity or by hand and ash removed mechanically or by hand.

Improved Construction and Operation

The improvements embodied in the Model Automatic pertain to simpler and better construction, interchangeability of parts, greater durability, ready access and minimum cost for renewals, adjustability to meet varying requirements due to variations in fuel or of duty, regularity of fire, variable to suit requirements, constant automatic cleaning of fire, insuring continuous smokeless combustion, greater utility and minimum labor for attendant.

Its efficiency and general utility is admittedly unequaled by any other type or make of boiler furnace.

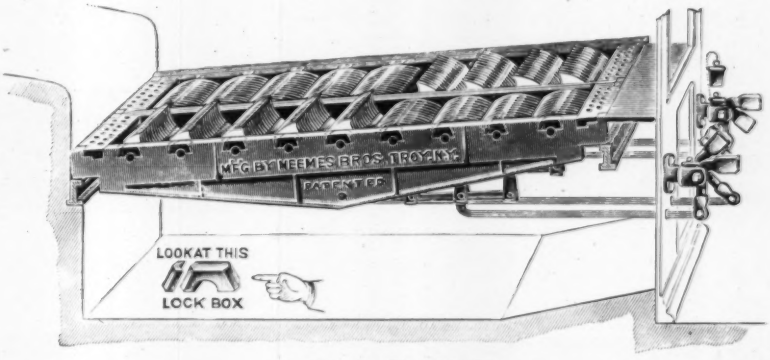
The only furnace which KEEPS the fire CLEANED.

NEEMES BROTHERS

24-30 River Street, ESTABLISHED 1874 TROY, N. Y., U. S. A.

Babcock & Wilcox, Lmtd., Montreal, Canada. Sole makers for Canada.
The Burke Engineering Co., 525 Industrial Trust Bldg., Providence, R. I.
Sole Agents for the New England States.

MANUFACTURERS OF SQUARE AND ROUND GRATES



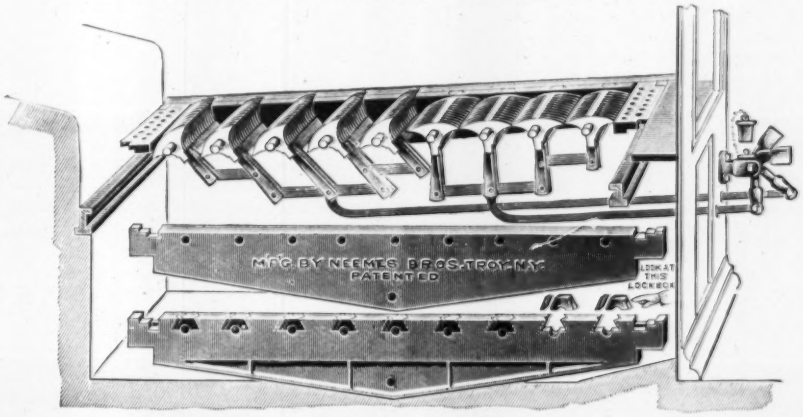
A COAL-SAVING GRATE

A grate which uses the coal wastelessly and which is so constructed that long life and continually satisfactory grate service are features.

NEEMES BROS. IMPROVED SHAKING AND DUMPING GRATE

It is a triple value grate—enables you to shake out your ashes, cut out your clinkers, or dump your fire, if necessary. This grate cuts the clinker from both sides of the shaker alike. This is the kind of a grate that is wanted today, and not one that merely shakes out a little ashes. It burns all kinds and grades of fuel, and burns it all up. The construction of the grate is strong. The teeth cannot break off, as we cut and crush the clinker in the center of the concaved teeth, and not on the points of the teeth. It is easy to operate, thoroughly dependable; it accomplishes perfect results with cheaper coal and with less coal than you are now using, thus effecting a double saving, and assures perfect combustion of any grade you may use. The Lock Box is also an important feature. When the shakers are set in the frame, and the boxes put in with the Locks, no shaker can possibly raise in the fire.

This grate is backed by many years' experience as grate manufacturers.



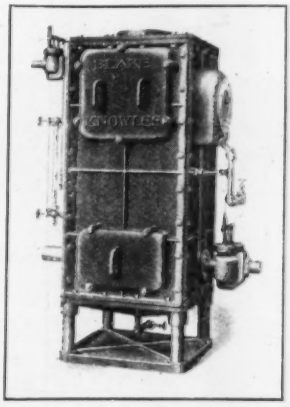
THE BLAKE & KNOWLES STEAM PUMP WORKS

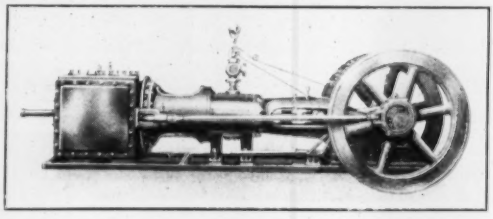
MAIN OFFICE: 115 BROADWAY, NEW YORK
FACTORY: EAST CAMBRIDGE, MASS.

FEED WATER HEATERS

Both Open and Closed Types

Sizes for all conditions of service





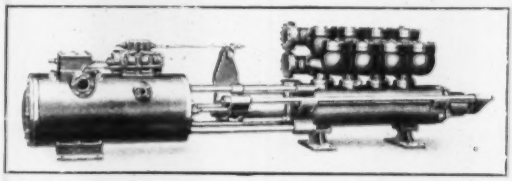
ROTATIVE DRY VACUUM PUMPS

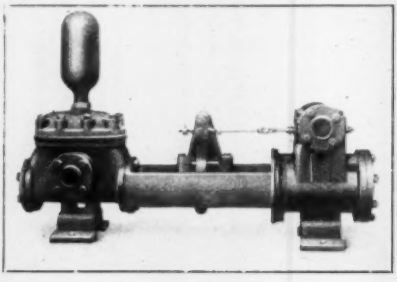
Steam and Power

For High Vacuum Service

SINGLE COMPOUND PLUNGER PUMPS

For Boiler Feeding, Elevator Service, Etc.

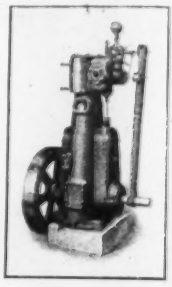




VERTICAL HIGH SPEED STEAM ENGINES

Single or Double

For Pumping or Generating Service

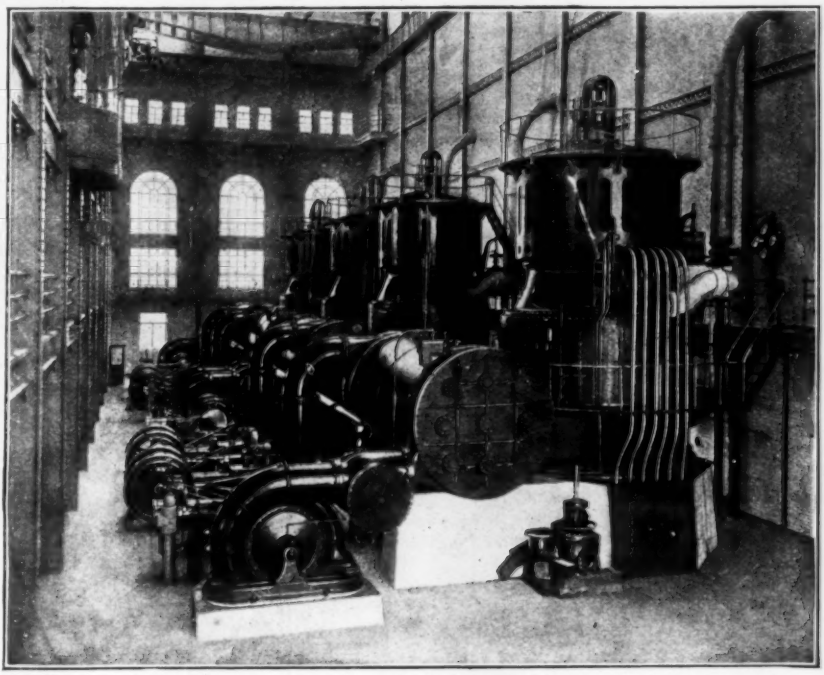


IMPROVED SIMPLEX PUMPS for Boiler Feeding, Pressure and Tank Service

HENRY R. WORTHINGTON

115 BROADWAY, NEW YORK

SURFACE, BAROMETRIC AND CENTRIFUGAL JET CONDENSING SYSTEMS, COMPLETE WITH AUXILIARIES FOR HIGH VACUUM WORK:—COOLING TOWERS, DUPLEX DIRECT-ACTING, CENTRIFUGAL, TURBINE PUMPS FOR EVERY SERVICE; BOILER FEED, ELEVATOR, FIRE, PRESSURE PUMPS; WATER METERS; WATER WORKS, SEWAGE AND DRAINAGE PUMPING ENGINES.



One of the N. Y. C. & H. R. R. Co. Power Plants

All WORTHINGTON CONDENSING APPARATUS, whether of the SURFACE or JET type, is designed upon the counter-current principle, and is capable of maintaining in service the highest vacuum attainable with the quantity and temperature of water for which it is designed.

The success of this apparatus has been due to its careful development along scientific engineering lines, in many of which the WORTHINGTON COMPANY was the Pioneer. All of the details of design are carefully worked out with reference to durability as well as efficiency and absolute reliability in service.

The WORTHINGTON COMPANY will be pleased to furnish preliminary estimates, drawings and advice at all times.

THE KENNICOTT COMPANY

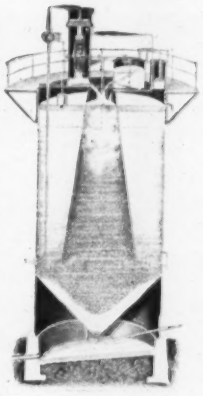
CHICAGO HEIGHTS, ILL.

Sales Office
11th Floor Corn Exchange Bank Building,
Chicago, Ill.

Eastern Office
50 Church Street,
New York, N. Y.

WATER SOFTENERS FOR THE TREATMENT OF WATER FOR BOILER FEED PURPOSES, FOR RAILROADS AND INDUSTRIAL PLANTS, FOR THE USE OF LAUNDRIES, TANNERIES, DYE WORKS, AND ANYWHERE WHERE A SOFT, CLEAR WATER IS OF ADVANTAGE.

DESCRIPTION OF OUR TYPE "K" WATER SOFTENER



The type "K" KENNICOTT WATER SOFTENER, a sectional view of the same being shown at the right of this description, represents the many years' experience which THE KENNICOTT COMPANY has had in WATER SOFTENING.

In order to have a perfect water softener it is necessary to have a machine that will automatically treat varying quantities of water with varying quantities of materials, and which will require the least possible amount of attention and soften a water at the lowest possible cost. This has been accomplished in our type "K" machine.

This machine is continuous in its action, automatically starting and stopping with the beginning and ceasing of the flow of the water into the softener. The water is pumped but once into the softener, and it is delivered at the top. The water as it flows into the softener furnishes all the power the apparatus requires, both for mixing the chemical reagents of the water to be purified as well as for operating automatically all the mechanism of the apparatus. One great particular advantage of this machine is that the parts *REGULATING* the feed of chemicals do not come in contact with the chemicals and, therefore, cannot be subject to stoppage and cannot in any way be affected by the chemicals.

The conical down-take in the softener, and thorough mixing which the water receives in the top of the down-take is of the greatest possible advantage in reaction and sedimentation. By the above means the water becomes quiet as quickly as possible after being thoroughly mixed with the chemicals. The softeners are designed so that the rate of flow in inches per hour is low and sedimentation, therefore, takes place very rapidly.

The softeners are designed to be either top operated, where it is necessary to economize on ground space, or all the chemical mixing and feeding tanks can be located on the ground.

Many machines of both types can be seen in operation and have been in operation for several years.

This type "K" softener has been built in every size from 150,000 gallons of water per hour to 500 gallons of water per hour. The largest CONTINUOUS STEEL TANK SOFTENER in the world having been built and installed by THE KENNICOTT COMPANY. All our experience has been directed towards building a machine which is guaranteed to produce uniform results and WE HAVE MADE GOOD.

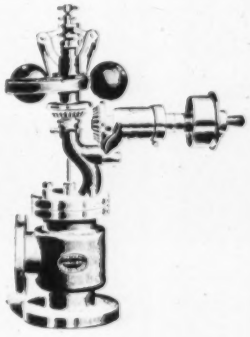
We publish a full description of the operation of this type "K" softener which gives detailed information and also gives photographs of many of the softeners which have been installed for some of the best known firms and railroads in this country and abroad. They cover almost every line of business. The matter referred to will be mailed you upon request.

WATERS GOVERNOR COMPANY

1122 Oliver Bldg., BOSTON, MASS.

REDUCING VALVES AND ENGINE GOVERNORS

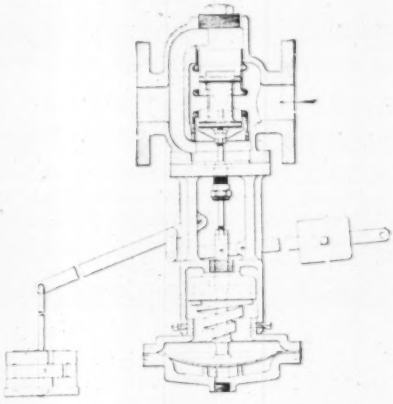
ENGINE GOVERNORS



These Governors are suitable for every variety of stationary and portable steam engine. They have adjustable speed regulation, automatic safety stop, Sawyer's lever, solid composition valves and seats, and all parts interchangeable.

The Waters Governors have been in use over forty years and have steadily grown in favor since their introduction. The design is such that they are not affected by the action of gravity, the weight remaining always in the same plane. The valve is of large area, greatly in excess of the steam pipe, and being quick acting and sensitive, insures economical results as well as close regulation. The valves are evenly balanced and have large openings with small travel.

Catalog on Request.



REDUCING VALVES

The accompanying illustration shows our Improved Reducing Valve. The "simplicity" of its construction can readily be seen and appreciated, while its "accessibility" can also be noted at a glance.

Diaphragm is connected by a $\frac{1}{2}$ inch pipe with the low pressure side, and the pressure in the diaphragm chamber, working against the spring, tends to close the valve, spring opening the valve when the pressure falls. A wide range of reduced pressures can be easily and quickly obtained. Particularly desirable for steam heating purposes. The square weight, fastened with a set screw, is simply a counterweight, to be moved in or out as the case may be, to obtain any pressure in between any two weights placed on the scale pan. These valves require no head room, hanging below the line of piping, and can be removed downward, leaving valve chamber only in line of pipe.

We wish to emphasize the fact that with Waters Valves it is not necessary to buy a special valve with outlet larger than inlet, at increased cost. With our valves an enlarged outlet flange answers exactly the same purpose, because the control to operate our valve is taken outside the valve itself. Valves and seats made of a special mixture can be furnished for use with superheated steam. All parts made interchangeable. Our diaphragms are made of special flat stock and shape themselves. In an emergency any good sheet packing can be used temporarily. A special valve for vacuum heating systems is made with very large diaphragm and double-ended single lever, to reduce to atmosphere or below.

Write for Catalog.

THE NATIONAL PIPE BENDING CO.

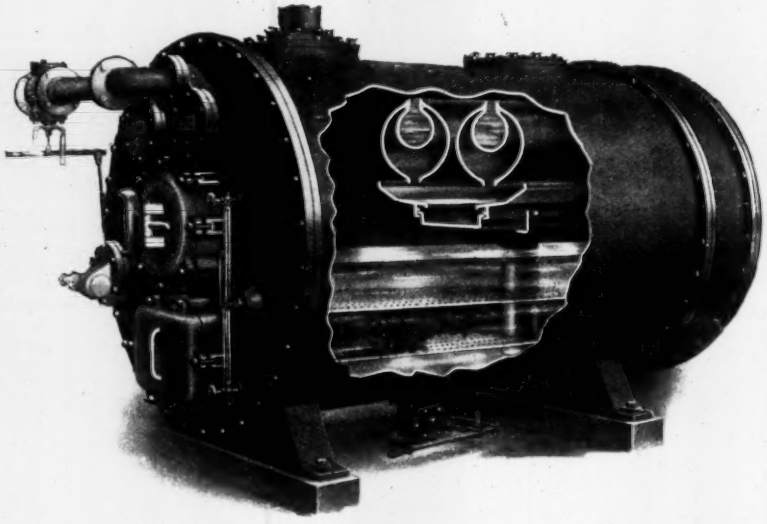
Boston Office
54 High Street

Main Office and Works
NEW HAVEN, CONN.

New York Office
149 Broadway

THE NATIONAL COIL OR CLOSED FEED-WATER HEATER. THE NATIONAL DIRECT CONTACT FEED-WATER HEATER AND PURIFIER. NATIONAL STORAGE HEATERS, NATIONAL STEAM AND OIL SEPARATORS, COILS AND BENDS OF IRON, BRASS AND COPPER PIPE.

THE NATIONAL DIRECT CONTACT FEED-WATER HEATER AND PURIFIER

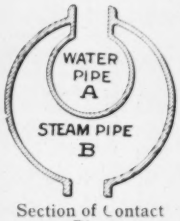


METHOD OF TRANSMITTING HEAT FROM EXHAUST STEAM TO THE WATER

From a regulating valve, the water enters a manifold cast on the front head of the heater which serves as a distributing chamber to the contact pipes, which consist of a double cast-iron pipe cast together one within the other, and closed at opposite ends.

The Water Pipe (A) has a port extending its full length upwards to the outside surface of the steam pipe with vertical walls isolating one from the other.

The Steam Pipe (B) has a port its full length at the bottom, through which all the steam must pass to enter the Heater.



Section of Contact Pipe

The water entering the water pipe flows upward through the port and passes in a thin film over the entire outer surface closely all the way around, until it reaches a rib projecting from each side of the port opening at the bottom of the steam pipe, where it is broken up into two sheets of fine spray.

The steam after passing through the Oil Separator enters the steam pipe, and the only outlet for the steam is the port at the bottom.

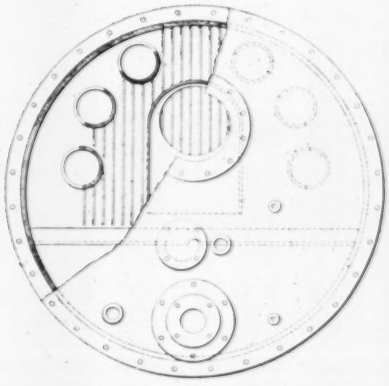
The Cold Water Pipe, being inside of the Steam Pipe, is surrounded by steam and the coldest water and hottest steam are first brought together through contact with the thin walls of the Water Pipe, then the pre-heated water is further heated as the thin film of water passes over the outer surface of the steam pipe, and finally all of the water and all of the steam are brought into direct and actual contact.

THE NATIONAL PIPE BENDING CO.

THE OIL SEPARATOR

The Oil Separator is part of the Heater and forms the back head and is of the same diameter as the shell. It is of the gravity type, having a multi-ported baffle plate, each port having an individual baffle.

These individual baffles are obtained by having an opening in the back of pipes which extend from the ports in baffle plate to the outer wall of the Separator. They absolutely prevent oil from being carried into the heater. The large cubical capacity of the Separator not only insures the effective separation of oil from the exhaust steam, but it also overcomes the pulsations of exhaust and gives an even flow of steam to the heater.



Oil Separator (Part of the Heater itself)

FILTRATION

Upward filtration is used. A large sediment chamber in the bottom of heater relieves filter bed of unnecessary work. A quick-opening blow-off valve on outlet from sediment chamber affords opportunity for draining heater and also causes a reverse current through filter bed, giving it longer life.

Patent applied for

THE NATIONAL HORIZONTAL OIL SEPARATOR

This Separator absolutely removes the grease or cylinder oil from exhaust steam so that the steam, when condensed, is perfectly suitable for boiler feed, laundry, or dye house service, ice making, or any other similar purpose.

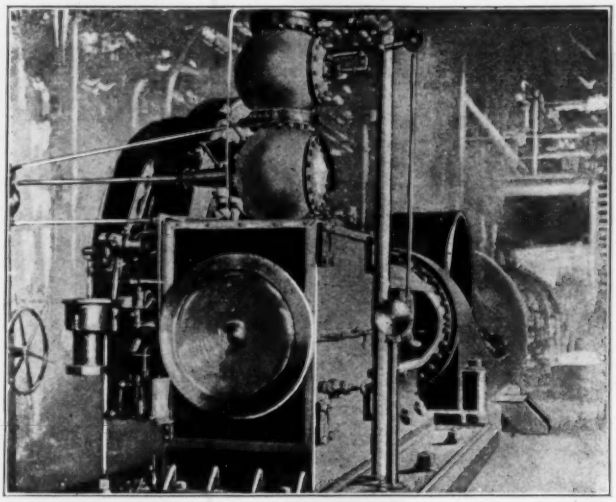
Note the multi-ported baffle plate, each port having an individual baffle, a distinctive feature found only in the National Separators.

THE STRONG, CARLISLE & HAMMOND CO.

CLEVELAND, OHIO

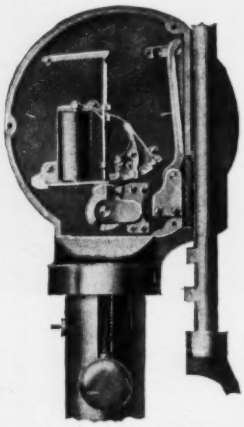
STRONG ENGINE STOP, STRONG STEAM TRAP, STRONG SEPARATORS FOR OIL OR STEAM, STRONG VACUUM TRAPS, STRONG REDUCING VALVES, STRONG PUMP GOVERNOR AND PRESSURE REGULATOR.

THE STRONG ENGINE STOP



One of ten engines in large mill equipped with this apparatus

The Strong Engine Stop is composed of three main parts, the quick-closing valve, the trip head, and the speed limit. The stop may be operated electrically or mechanically or by combining the two methods.



Trip Head Combined Electrical and Mechanical

Whether electrically or mechanically operated the result is the same: over-speeding of the engine is impossible. The "Speed Limit" device at the first instant of "Running Away," as evidenced by the increased speed of the line shaft, throws out a trip, which lets fall a rod and operates the "Quick Closing Valve." As soon as the trip is released, an alarm bell starts ringing and continues to ring until the trip head is reset. The engine having been brought to a stop by the closing of the quick acting valve, cannot be started until the stop has been reset.

CIRCUIT CLOSERS

At any desired points in the Engine room or about the mill, circuit closers may be installed as shown in the accompanying illustrations, the action of which in stopping the engine is practically instantaneous.

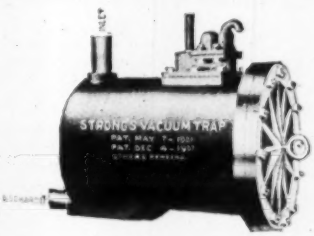
Circuit Closer for Strong Engine Stop

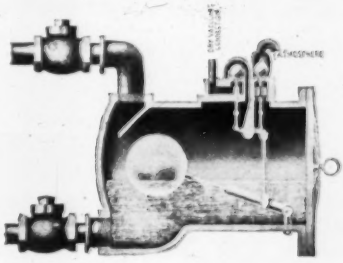
NO BELTS, CHAINS, GOVERNORS, ETC.

The action of the Strong Engine Stop is not dependent upon any of the devices named above, but is so simple and effective that we sell and install it under the same guarantee that applies to all "Strong" Specialties.

"We don't want a cent of money until you are satisfied."

THE STRONG, CARLISLE & HAMMOND CO.





Strong Vacuum Trap

The Strong Vacuum Trap automatically removes water from the vacuum lines of condensing engines, from the receivers of compound engines, from vacuum oil separators, etc., thus preventing accidents which might otherwise occur from the back suction of water into engine cylinders.

The Strong Vacuum Trap is also designed for returning condensation from coils, radiators, etc. of low pressure heating systems, direct to the boiler.

CONSTRUCTION.—The Trap consists of a cylindrical shaped body made from a high grade of cast iron, to which is bolted the head. This joint is machined and absolutely tight. To the top of the trap is attached the frame for the valves with a dry vacuum and atmosphere ports as shown by cut. Into this frame are screwed the seats for the vacuum and atmospheric valves. The valves consist of ground brass balls, operated by levers having heavy phosphor bronze bearings. The mechanism is operated by a Hercules patented copper float connected by heavy phosphor bronze and brass rods. No steel or iron is used in the working parts. The traps have no trunnions to adjust, no stuffing boxes to pack, no tilting devices to balance, and REQUIRE NO STEAM TO OPERATE THEM when discharging the water to the atmosphere and only a sufficient amount of steam to balance the back pressure when discharging to an elevation.

There is not a delicate part in their construction. The valves are in the top of the trap and may be inspected by removing the small caps encasing them. It is impossible for dirt to get at the working parts, as they are above the water line and almost the length of the trap away from the inlet. Every trap is inspected and rechecked before leaving our factory, and is ready to go into service.

TABLE OF SIZES AND CAPACITIES

Size No.	Outlet and Inlet	Distance Floor to Inlet	Total Length	Total Height	Diameter Body	Diameter Flange	Capacity Gallons Hour—Over	Shipping Weight	List Price
	Inches	Inches (Center of Inlet)	Inches	Inches	Inches	Inches			
8	1½	16	24	23	11	14	400	235	$120.00
9	2	21½	28	29	18	20½	700	410	200.00
10	2½	21½	28	29	18	20½	1000	410	200.00
11	3	21½	28	29	18	20½	1600	410	200.00

Swing check valves are furnished for inlet and outlet. Ball and lift checks should not be used

Discount on application

THE FOSKETT & BISHOP CO.

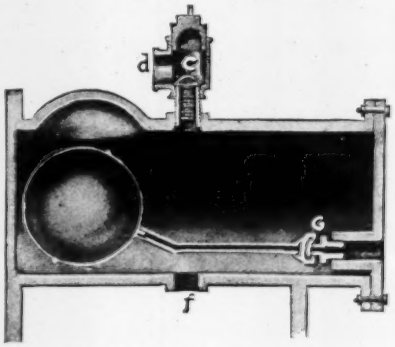
NEW HAVEN, CONN.

ENGINEERS AND CONTRACTORS, POWER PLANTS, GRINNEL AUTOMATIC SPRINKLERS AND APPLIANCES, HEATING, PLUMBING AND GAS FITTING, STEAM TRAPS, STEAM SPECIALTIES

THE FOSKETT & BISHOP PATENT IMPROVED STEAM TRAPS

DESCRIPTION.—The valve comprises the seat which screws into the head, and a disk which is attached to the seat by a hinge and has composition packing set in a slot made in said disk.

G is a heavy copper ball or float tested at a pressure of 300 pounds per square inch, attached by a brass rod to the disk of said valve. The outlet in head is where the water is discharged from the trap; D is the steam and water inlet; C is a copper strainer or basket; H is a plug, by unscrewing which access is had to the strainer for cleaning it; F is an outlet for drawing off all the water from the trap if desired, or discharging water of condensation when exhaust steam is used.



Patent Improved Steam Trap

OPERATION.—When steam is let on to radiators or coils to which the trap is attached, the water flows before the steam into the shell until the float G is raised, which lifts the disk from the seat of the valve and the water is discharged through outlet in head. When enough water is thus discharged to allow float G to fall, the valve is closed and the water again accumulates preparatory to another discharge; so it continues to work, never failing to discharge the water if enough is present to raise the float.

STANDARD SERVICE.—These Traps are recommended for any service requiring the removal of water of condensation without escape of the steam behind it.

For draining the condensation from steam pipes, coils, and apparatus employed in steam heating, steam kettles, vacuum pans, mash kettles, steam engine supply pipes and separators, evaporating pans, steam jackets on engines and pumps, ice machine stills, etc.

PRESSURE CONDITIONS.—In ordering it is important that the steam pressure under which they are to be used should be stated.

The Standard Trap is designed for an extreme pressure of 100 pounds, but where this pressure is to be constant, or likely at any time to exceed this limit, it is better to use the extra heavy type.

Where the Trap is to be used under extreme low pressure conditions,—1 to 20 lbs.,—the duty should be specifically stated, in order that a valve of proper area may be supplied. For this duty the Standard Trap is furnished, but with a larger opening than is used for the ordinary service, which is between 20 and 100 lbs.

TRAP CONNECTIONS.—In selecting a Steam Trap for a given duty it should be borne in mind that the size of the inlet in no way governs the capacity of the Trap, therefore the pipe entering Trap at "inlet" may be arranged to suit connections without affecting the operation of the Trap—care being taken that a Trap of proper capacity is selected for the work.

Should the duty exceed the capacity of the largest Trap listed, two or more Traps may be readily placed side by side, connected to a common horizontal header and operated as one Trap, in order to obtain the necessary trappage capacity.

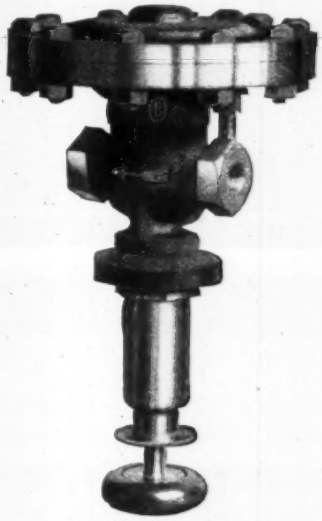
SIZES, DIMENSIONS, CAPACITIES

Number of Trap	0	1	2	3
Size of inlet connection	1 in.	1¼ in.	1¼ in.	2 in.
Size of outlet connection	½ "	½ "	¾ "	1¼ "
Maximum discharge lbs. water per minute	2	4	8	20
Greatest number of lineal feet of 1 inch pipe surface to which trap should be applied	800	1500	4000	10000

THE OHIO BRASS CO.

MANSFIELD, OHIO

OHIO STEAM SPECIALTIES



Ohio Regulating Valve

OHIO PRESSURE REGULATING VALVE

FOR STEAM OR AIR

Patented

Reduces and regulates accurately and continuously.

Self-contained, no tight fits, will not stick.

Simple and rugged in construction.

Made in all bronze in ¼ to 2 inches.

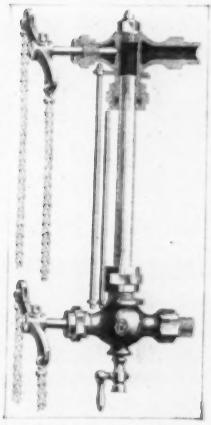
Made in iron body with bronze working parts in 2½ to 4 inches.

OHIO WATER GAUGE

Comes packed with high grade packing, ready to use.

Quick opening—opens or closes with a quarter turn of levers.

Made of high grade steam bronze in ½ and ¾ inch.



Ohio Water Gauge

OHIO STANDARD GAUGE COCK

A simple twist of the wrist stops a leak.

Has babbitt disc "1" which is rotated to a tight seat by screw "2."

Made in ½ and ¾ inch.

Ohio Standard Gauge Cock

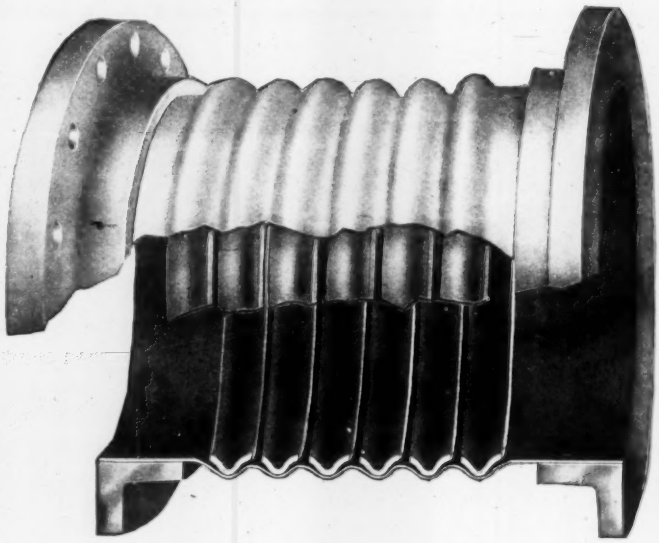
Descriptive Catalog M.E. mailed on request

E. B. BADGER & SONS CO

63-75 PITT ST.

BOSTON, MASS.

COPPER EXPANSION JOINTS



BADGER'S COPPER EXPANSION JOINTS

Will take care of the expansion and contraction in pipe lines, absorb vibration in engine and turbine exhausts, etc.

Our regular joints are built in sizes from 1″ to 7′ 0″ in diameter; larger joints constructed for special work.

These joints may be employed in high pressure, vacuum or exhaust lines; the construction suits the particular case.

The principal difficulty with expansion joints has been in the unequal distribution of the expansion among the different corrugations, resulting in excessive strain on, and probably rupture of, one of the corrugations.

Our patented internal and external equalizing ring construction prevents any one corrugation from doing more than its share of the work, and provides at the same time a stiffer and stronger joint.

As to amount of expansion: Our 12″ diameter, 3 corrugation, 12″ face to face joint will take up easily $1\frac{1}{2}$″ expansion; others in proportion to diameter, number and size of corrugations, etc.

Unless otherwise specified, we furnish standard A.S.M.E. flanges.

Write for full particulars.

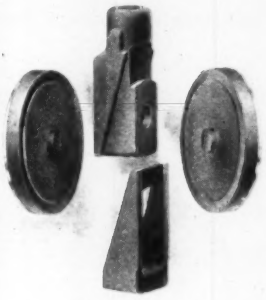
THE DARLING PUMP & MFG. CO. Ltd.

WILLIAMSPORT PA.

Sales Offices:

New York City, 149 Broadway
Philadelphia, Arcade Building
Chicago, The Rookery
Boston, 141 Milk Street

DARLING GATE VALVES, FIRE HYDRANTS INDICATOR POSTS, FLOOR STANDS, VALVE BOXES, BALL CHECK VALVES, MADE FOR ALL PRESSURES AND PURPOSES



Wedging Mechanism—Shown with Parts Separated

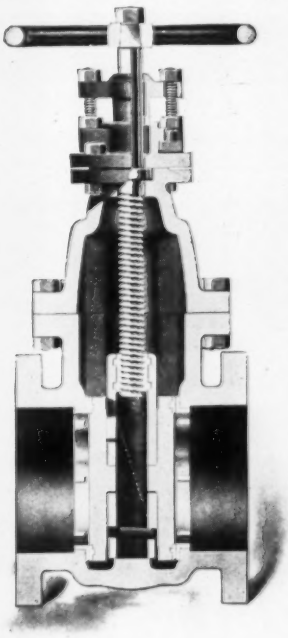
The Gate Discs being plain, no portion of the Wedging Mechanism is formed upon them. These Gate Discs revolve independently of the wedges, and independently of each other. The Revolving Gate Discs change their positions on the Seats each time the Valve is closed, thus distributing wear equally over entire Faces of Gates and Seats, ensuring Durability.

Gates Released Before Opening, Avoiding Wear on Seats.

Cannot Stick or Bind.

Simple, Reliable, Durable.

The Darling Patented Gate Valve has Parallel Seats, Double Revolving Gate Discs and Compound Equalizing Wedges. The Wedging Mechanism operates Between the Gate Discs and Independent of them.



Sectional View of Inside Screw Valve with Flanged Ends

PITTSBURGH VALVE, FOUNDRY & CONSTRUCTION CO.

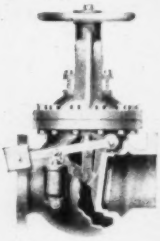
PITTSBURGH, PA.

ENGINEERS, MANUFACTURERS AND ERECTORS

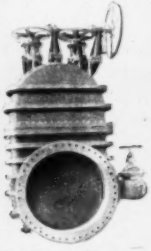
Designers and Builders of Valves, Fittings and Appliances of Every Description for Steam, Gas, Water, Air and Hydraulic Piping.

Designs and Estimates for special valves and equipment furnished upon receipt of specifications.

Atwood Horizontal Separator



Outside Dashpot Non Return Valve



48″ Double Spindle Gate Valve

120″ Butterfly Valve

Hand Operated Gate Valves.
Electrically Operated Gate Valves.
Cylinder Operated Gate Valves.
Quick Opening Gate Valves.
Globe, Angle and Cross Valves.
Check Valves.
Butterfly Valves.
Critchlow Operating Valves.
Tanner Operating Valves.
Aiken Operating Valves.
Relief Valves.
Back Pressure Valves.
Non Return Valves.
Throttle Valves.
Transfer Valves.
Register Valves.
Float Valves.
Foot Valves with Strainers.
Blow Off Valves.
Plug Valves.
Hydraulic Cocks.
Tuyere Cocks.
Hydraulic Spring Cushions.
Gas Line Materials.
Pressure Regulating Stations.
Cast Iron Pipe.
Pipe Fittings and Flanges.
Pipe Bends.
Expansion Joints.
Exhaust Heads.
Steam Separators.
Drip Pockets.
Strainers.

PITTSBURGH VALVE, FOUNDRY & CONSTRUCTION CO.

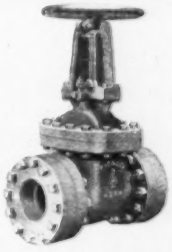
PITTSBURGH, PA.

GATE VALVES

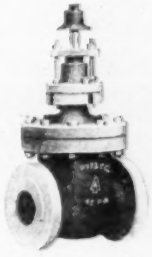
SPECIFICATIONS FOR MATERIAL	Grey Iron—22,000 lb. per sq. in. tensile strength. Semi Steel—33,000 lb. per sq. in. tensile strength.
PARALLEL SEAT 50 lb. WORKING PRESSURE 100 lb. TEST PRESSURE	Sizes 14″ to 72″ cast iron. Low pressure. For water, gas, air or exhaust steam. Extremely close face to face, invaluable in complicated piping connections.
PARALLEL SEAT 125 lb. WORKING PRESSURE 300 lb. TEST PRESSURE	Sizes 2″ to 48″ cast iron. Standard pressure. For water, air, steam or gas. Fully bronze mounted. Especially adapted to water distribution.
PARALLEL SEAT 200 lb. WORKING PRESSURE 400 lb. TEST PRESSURE	Sizes 1½″ to 16″ cast iron. Largely used for natural gas under the lower pressures. Furnished either all iron or iron body bronze mounted.
PARALLEL SEAT 400 lb. WORKING PRESSURE 800 lb. TEST PRESSURE	Sizes 3″ to 20″ semi steel. In extensive use for the transmission of natural gas. Furnished either with or without bronze mountings.
PARALLEL SEAT 500 lb. WORKING PRESSURE 1500 lb. TEST PRESSURE	Sizes 2″ to 12″. For water or oil at pressure noted. Semi steel with solid bronze mountings.
PARALLEL SEAT 1000 lb. WORKING PRESSURE 1500 lb. TEST PRESSURE	Sizes 2″ to 12″ semi steel. High pressure gas valve used chiefly at the gas wells and on feeders in the gas fields.
PARALLEL SEAT 1500 lb. WORKING PRESSURE 2000 lb. TEST PRESSURE	Sizes 2″ to 10″ semi steel. For hydraulic service and extreme natural gas rock pressures.
TAPER SEAT 175 lb. WORKING PRESSURE 500 lb. TEST PRESSURE	Sizes 2″ to 16″ semi steel. A valve for medium steam pressures from 125 lb. to 175 lb. where a less expensive valve than the 250 lb. type is desired.
TAPER SEAT 250 lb. WORKING PRESSURE 800 lb. TEST PRESSURE	Sizes 1½″ to 28″ semi steel. Made of semi steel with solid bronze mountings for ordinary steam pressures or of cast steel with monel mountings for superheat.
TAPER SEAT 1000 lb. WORKING PRESSURE 2000 lb. TEST PRESSURE	Sizes 2″ to 10″. The strongest valve possible to make in its weight, all surfaces being cylindrical or spherical segments.
GATE VALVES FOR ANY PRESSURE	Designs and quotations furnished for valves for special conditions or higher pressures. Materials used are those best adapted to service.

(See also next page)

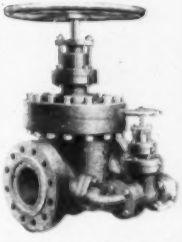
50 lb. Parallel Seat Gate Valve. Close Pattern



8″ 500 lb. Gate Valve



4″ 1000 lb. Gas Line Gate Valve

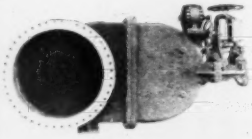


3″ 1000 lb. Hydraulic Gate Valve

(Continued from preceding pages)

PITTSBURGH VALVE, FOUNDRY & CONSTRUCTION CO.

PITTSBURGH, PA.

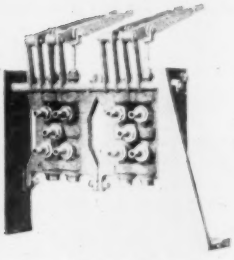


48″ Motor Operated Gate Valve

30″ Gate Valve Operated by Air Cylinder

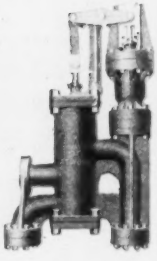
Any of the foregoing gate valves may be equipped with operating cylinders for any service or pressure, or motors for either direct or alternating current.

The following types of operating valves are extensively used for the control of motion of hydraulic cylinders, either single or double acting.



Group of Two Critchlow Nests

The **CRITCHLOW VALVE** is the simplest form of hydraulic three or four way piston valve and has no superior for working pressures up to 500 pounds. It is durable and easy to repack. The CRITCHLOW NEST furnishes a means of grouping these valves which yields a great saving in pipe, fittings, manifolds and space, where a number of cylinders are to be operated from one pulpit.

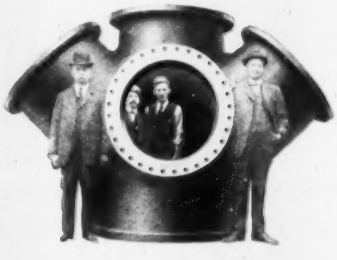


Tanner Valve with Actuating Cylinder

The **TANNER VALVE** is more satisfactory than the Critchlow on high pressures. It is of the cup-packed piston type, so designed that the fluid forces the packing away from the ports instead of into them, prolonging the life of the packing and making operation easy. The arrangement of supply and waste ports facilitates attaching to manifolds. Larger sizes can be furnished with actuating cylinder permitting remote control by means of a pilot valve.

The **AIKEN VALVE** has given complete satisfaction to a large number of users for many years. The designs and patterns for this valve have been purchased from the inventor, Henry Aiken, M.E., and valves can be made to meet any requirements.

Special facilities for casting and machining large pipe and fittings as well as all classes of work such as furnace castings, general castings, etc.



60″ x 42″ x 42″ x 42″ Special Cross with 30″ Side Outlet

PITTSBURGH VALVE, FOUNDRY & CONSTRUCTION CO.

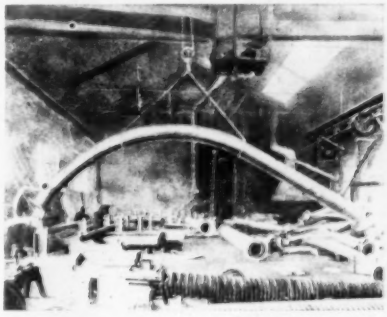
PITTSBURGH, PA.

PIPING SYSTEMS

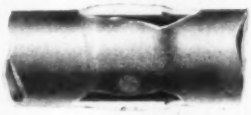
For all Pressures and Purposes,
Designed, Manufactured
and Installed

Pipe Bending Pipe Cutting
Pipe Fitting

Estimates furnished on receipt
of specifications



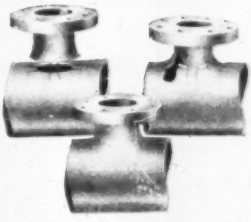
20" Expansion Bend—Radius 16 Ft.
This bend contains 38 ft. of pipe and was made
of two lengths joined in the arc by
the Atwood Line Weld



The Atwood Line Weld
Patented

THE ATWOOD LINE WELD

This method of joining the abutting ends of wrought pipe allows the fabrication of pipes into lengths as long as can be handled for shipment with consequent reduction by about 50 per cent of the number of flanged joints in the line.



The Interlock Welded Neck
Patented

INTERLOCK WELDED NECKS

This method of connecting branch lines of wrought pipe to mains of the same material was developed in response to the demand of steam users for a structure containing the minimum number of joints. Every branch so connected eliminates a cast fitting with its attendant joints, gaskets and bolts and liability to trouble therefrom.

The Atwood Joint

FLANGED JOINTS

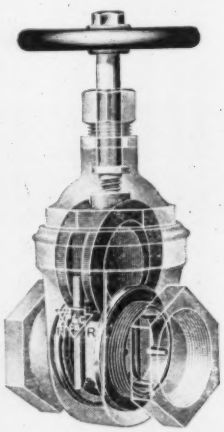
Atwood, Screwed, Shrunk, Expanded and Welded.

ATWOOD

THE PRATT AND CADY COMPANY

HARTFORD, CONN.

VALVES FOR ALL PURPOSES



GATE VALVES

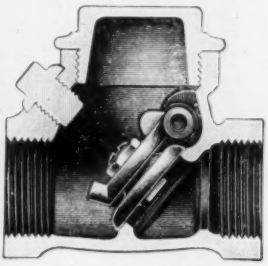
With renewable seat rings, held in place by a retaining ring that is easily removed.

Screw Hub, Stationary Spindle, Retaining Ring Construction.

The seat rings are independent rings of bronze, or any special metal or material best adapted for the service in which the valve is to be used. The gate is a double faced, wedge shaped casting, with side grooves by means of which it slides on guides in the valve body.

Great pains are taken in the machining of all parts of these gate valves. Gauges are used on each part to insure their accuracy and interchangeability.

The guides in our bodies are of equal thickness, and the wedge can be taken out of the valve and replaced with the opposite faces in contact, and will give an accurate fit. The importance of this in making repairs is obvious. These valves being double seated, can be used with the pressure applied at either end.

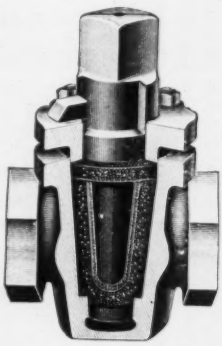


REGRINDING SWING CHECK VALVES

Brass and Iron

All styles for all pressures, sizes up to 48 inches.

The *Design* combines pressure resistance with easy flow lines. Material (of brass valves) is 86% pure copper. We use no scrap in their production. *Workmanship*—Each valve is individually tested to the pressure stated in catalog. All seats are carefully ground. Assembling is done by our most careful hands. The *Interior Construction* permits the replacement of any working part without removing valve from line. *For Regrinding* no tool is necessary but a wrench and brace and bit.



ASBESTOS-PACKED COCKS

The dovetailed U-shaped grooves in the body are packed with prepared asbestos. An asbestos ring is used on the shoulder of the plug for top packing.

The plug is of standard taper carefully finished and barffed to render it rustless. It has no metallic bearing, coming in contact only with asbestos, the elasticity of which compensates for the differential expansion and contraction of the plug and body. The gland admits of adjustment by means of its bolts.

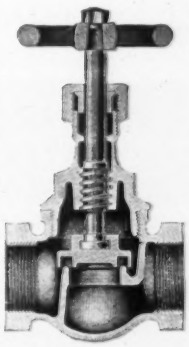
These cocks give exceedingly satisfactory results as a boiler blow-off and a water column blow-off, between check and boiler, between water column and boiler, and they do work where ground plug cocks are unsatisfactory and where Globe, Angle or Gate Valves fail.

THE PRATT AND CADY COMPANY

HARTFORD, CONN.

VALVES FOR ALL PURPOSES

ASBESTOS DISC VALVES



The Stuffing Box Gland is long, heavy and well fitted.

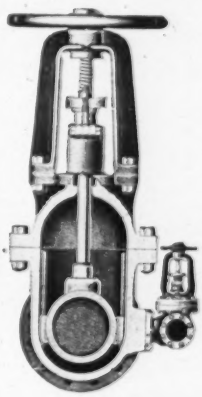
The Spindle Collar, and its point of contact with the bonnet, have specially smooth surfaces and make a steam-tight joint when valve is fully open.

The Disc Holder is guided by four splines in the body, assuring perfect alignment at all times. The Disc Holder is of the horseshoe type, and can be removed and replaced, the only tool necessary therefor being a wrench to unscrew the bonnet.

The Seat is spherical, thus preventing the settling thereon of any substance that might hold the disc from going squarely to its place. The metal used in the construction of these valves is approximately 86% pure copper. We use no scrap whatever in the construction.

The Valve complete is finished with the utmost care. When so ordered, these valves can be made with solid brass disc, or with brass disc holder filled with special metal, at additional price.

CAST STEEL GATE VALVES FOR SUPER-HEATED STEAM



All Valves $2\frac{1}{2}$" and larger are equipped with Cast Steel Bodies, Bonnets and Wedges.

The Seats and Faces of the Wedges are made of Pure Nickel, securely fastened in place so that they will be unable to work loose.

Stems are Nickel Steel.

All Bolt Holes are Spot Faced.

Bonnet Joint is packed with "Palmetto" Superheat Packing.

The End Flanges have $\frac{1}{16}$" Raised Faces, extending full width inside of Bolt Holes, with smooth finish.

All Bolts have Hexagon Heads and Nuts, with the under side of same semi-finished.

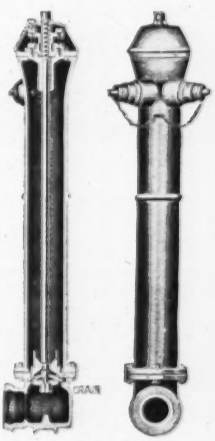
The Discs are of the Wedge Pattern.

Stuffing Box is made with Hinge Bolts, very deep for square "Palmetto" Packing.

Yoke is bolted to the Bonnet.

All tested to a hydrostatic pressure of 800 lbs..

COMPRESSION TYPE HYDRANTS



Without Intricacy of Construction.

Complete catalog of all Pratt and Cady products on request.

WALWORTH MANUFACTURING CO.

Established 1842

132 FEDERAL ST., BOSTON, MASS.

Works, South Boston. New York Office, Park Row Building.

Manufacturers of

HEAVY PRESSURE POWER PLANT PIPING MATERIALS

The WALWORTH up-to-date Catalog to be issued in 1912 will give full details, with illustrations, dimension Tables, etc., and will be furnished on request to interested parties. Write Department E.

The following will give you a general idea of our complete line—furnished both STANDARD and EXTRA HEAVY:—

WALMANCO FLANGED-OVER THREADLESS PIPE JOINTS, swivel ends for 250 pounds working pressure.
WALWORTH LONG SWEEP FLANGED AND SCREWED FITTINGS.
WALWORTH WROUGHT IRON OR STEEL PIPE BENDS, with threaded or Walmanco Joints.
WALWORTH ELBOWS, TEES, CROSSES, FLANGES, etc. (Brass and Iron), for all pressures.
"WALCO" MALLEABLE IRON BRASS SEAT UNIONS, ground joint.
FLANGES, Standard and Extra Heavy.
WROUGHT IRON PIPE WITH WELDED FLANGES.
STEEL PIPE DRUMS, with welded pipe nozzles riveted on, using Walmanco or welded flanges.
CAST IRON FLANGED PIPES.
CAST IRON BRACKETS, ROLLER CHAIRS AND FLOOR STANDS.
QUICK CLOSING SAFETY DEVICE FOR WATER GAUGE COLUMNS.
INJECTORS AND POP SAFETY VALVES.
ENGINE AND BOILER TRIMMINGS, WATER GAUGES, etc.

WALWORTH HIGH-GRADE GATE VALVES,

With Renewable Bronze Seats. Outside Screw and Yoke or Stationary Spindle. Spindles either Bronze or Steel. Can be repacked under pressure. Sizes up to 42 inches diameter.
STANDARD IRON BODY BRASS MOUNTED GATE VALVES for 125 pounds working pressure.
MEDIUM IRON BODY BRASS MOUNTED GATE VALVES for 175 pounds working pressure.
EXTRA HEAVY IRON BODY BRASS MOUNTED GATE VALVES for 250 pounds working pressure.
HYDRAULIC BRASS MOUNTED GATE VALVES, for 800 pounds working pressure.
BRASS GATE VALVES, standard and Extra Heavy.
"WALCO" BRASS GATE VALVES, for 125 pounds working pressure,
STANDARD AND EXTRA HEAVY IRON BODY GLOBE AND ANGLE VALVES,
Never-Stick Boiler Blow-off Cocks,
AUTOMATIC STOP VALVES, extra heavy.

For Heavy Pressure Piping we furnish:
WALWORTH SEMI-STEEL CASTINGS
For Drums, Valves and Fittings
(Average Tensile Strength, 33,500 Pounds)

We also manufacture a complete line of Pipe Fitters' Tools, Stocks and Dies, Pipe Cutters, Vises, etc., including the—

STILLSON GENUINE STILLSON WRENCH STILLSON

which bears the Diamond Trade Mark.

S. F. BOWSER & COMPANY, Inc.

Established 1885

FORT WAYNE, IND.

New York Boston Philadelphia Chicago St. Louis
San Francisco Minneapolis Dallas Atlanta Toronto

OIL SYSTEM ENGINEERS AND MANUFACTURERS

Oil System Engineers and Manufacturers of:

Oil Distributing Systems.

Self-Measuring Hand and Power Driven Pumps.

Underground Storage Systems.

Large Tankage.

Oil Storage Systems.

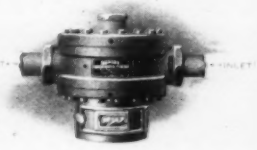
Automobile Filling Stations.

Dry Cleaning Systems.

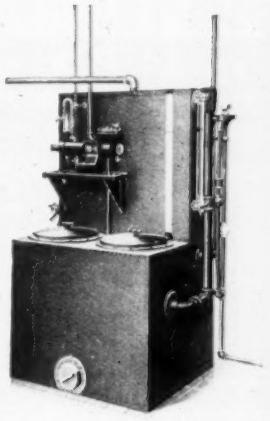
Self-Registering Pipe Line Measures.

Oil and Gasolene Storage Outfits for Public and Private garages.

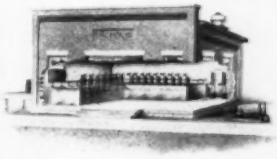
Oil Filtration and Lubricating Systems.



Registering Measure



Filtration System



Oil House

The Bowser line covers every requirement of the factory and railroad for oil storage equipment.

Our corps of mechanical and drafting engineers is at the command of those interested in this line.

Bulletins giving complete detailed description of any line will be furnished upon application and without obligation. We have a fund of information on oil storage and allied lines that will assist in making up specification for this work. Let us submit it.

Our catalogue No. 12B illustrates and describes the line in a limited way and shows a large number of installations in widely diversified fields. Write for it.

PITTSBURGH GAGE & SUPPLY CO.

PITTSBURGH, PA.

NEW YORK CITY: 136 Liberty St. BOSTON, MASS.: 54 High St. CHICAGO, ILL.: 174 N. Market St.

LUBRICATING APPLIANCES

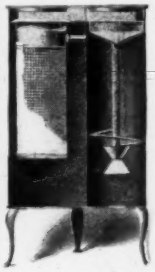
WHITE STAR OIL FILTERS AND OILING SYSTEMS

White Star Oil Filters are made in the following types:

Round: For small plants where a continuous oiling system is not contemplated, and delivery of oil is made to Filter by hand.

Duplex: For use in connection with automatic continuous oiling systems.

Multiplex: For oiling systems in very large plants. They are made for handling as much as 6000 gallons of oil per day.

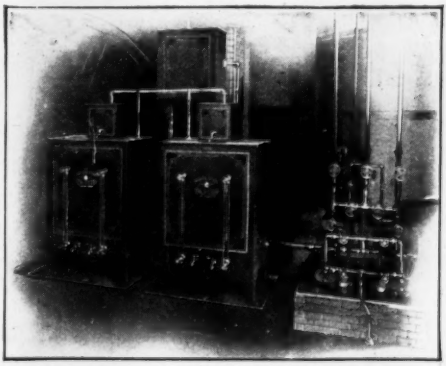


ROUND TYPE

Number of Filter	Filtering Capacity Gallons per 24 Hours	Holding Capacity, Gallons			List Price for Hand Operation	Shipping Weight lbs.
		Pure Oil	Dirty Oil	Water		
2	20	7½	5½	5	$35.00	115
4	35	9½	7½	6½	50.00	127
5	50	12	10	9	60.00	142
7	65	15	13	12	75.00	165
10	80	19	17	16	85.00	190
12	100	25	18	20	100.00	225

DUPLEX AND MULTIPLEX TYPES

Number of Filter	Filtering Capacity, Gallons per 24 Hrs.	Holding Capacity Gallons			List Price	Shipping Weight, lbs.
		Pure Oil	Dirty Oil	Water		
8	100	13	10	8	$95.00	190
17	150	38	11	8	125.00	285
20	200	64	17	14½	150.00	400
23	350	50	30	25	300.00	620
25	500	103	40	45	400.00	850
27	700	100	40	25	500.00	1000
59	1000	115	105	67	600.00	1500
100	2000	235	125	90	800.00	2000
150	3000	353	182	119	1000.00	2500
200	4000	476	257	177	1200.00	3000
250	5000	589	320	236	1500.00	3600
300	6000	710	365	236	1800.00	4200



A Typical Duplex Installation.

On request we will furnish bulletins showing our complete line of special Rotary, Double Acting, Simple and Duplex Pumps, Reservoirs, Separating and Drain Tanks, Sight Feeds, Compression Fittings, Piping Materials and accessories, special oiling devices and Force Feed Cylinder Lubricators.

In addition to manufacturing lubricating appliances, we make:

Gaco Safety Water Gages; a self-closing gage, the valves of which close instantly in case gage glass breaks.

Gaco Take-Down Gage Cocks—can be taken down under full head of boiler pressure.

Pittsburgh Safety Water Columns—Equipped with combined high and low water alarm attachment.

Pittsburgh Steam and Oil Separators—For removal of water and oil from live steam.

Pittsburgh Recording Gages—For recording pressure of steam, oil, gas, air; also vacuum.

Pittsburgh Vacuum Exhaust Heads—For removal of water, oil, etc., from exhaust steam.

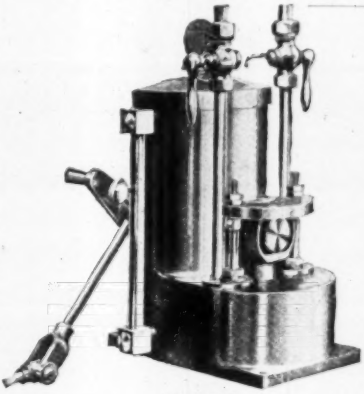
Gaco Dust Collecting Systems.

Pipe Bends and High Pressure Piping Work a specialty.

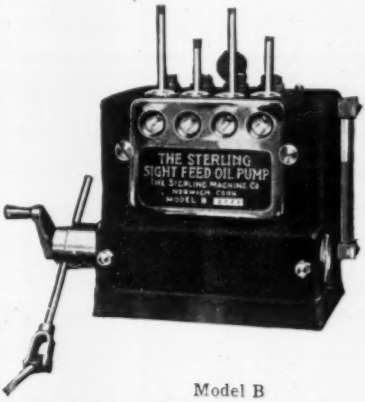
THE STERLING MACHINE COMPANY

NORWICH, CONNECTICUT

ACME ENGINES, STATIONARY AND MARINE; DIRECT CONNECTED GENERATOR UNITS; STERLING LUBRICATORS FOR AUTOMATIC FORCE-FEED LUBRICATION



Model A



Model B

STERLING FORCE FEED LUBRICATORS

are high grade oil pumps for providing positive lubrication with the minimum amount of oil. They are entirely automatic in action and save time as well as oil.

Model A is designed for use on steam engines and pumps and is made in the following sizes:

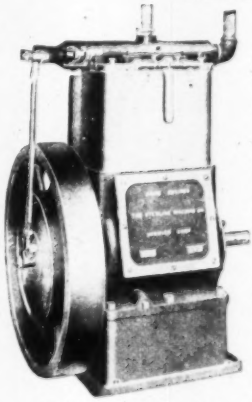
Number of Feeds	One						Two						Three			
Tank Capacity...	1 Pt.	1 Qt.	3 Pt.	½ Gal.	1 Gal.	1½ Gal.	1 Pt.	3 Pt.	½ Gal.	1 Gal.	1½ Gal.		3 Pt.	½ Gal.	1 Gal.	1½ Gal.

Model B is intended for use on large units and is especially adapted for lubricating the valves and cylinders of large gas engines, air compressors and similar units.

This model can be built in any capacity with any number of feeds. Standard sizes as follows:

Number of Feeds	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Tank Capacity...	4 Pt.	5 Pt.	6 Pt.	1 Gal.	1¼ Gal.	1½ Gal.	1¾ Gal.	1¾ Gal.	2 Gal.	2 Gal.	2¼ Gal.	2½ Gal.	2¾ Gal.	2¾ Gal.	3 Gal.	3 Gal.

ACME STATIONARY STEAM ENGINE



Acme Stationary Engine

This Engine is an upright, double-cylinder single-acting engine, with cranks 180° to each other; pistons being 1½ times the stroke in length, form their own guides. Cranks are of drop forged steel, large size in diameter and length. Main bearings are 2½ times diameter of shaft, bushed with bronze, and can be renewed when worn, at small cost. Valve is of the balanced rocking type, of extra long and large wearing surfaces, and is placed on top of cylinders, the valve-case forming the cylinder heads. Lubrication is accomplished by carrying in the crank case a mixture of oil and water, into which the cranks dip at every revolution, and are not only flooded themselves, but throw the oil to every part inside the case.

These Engines are especially adapted for Mechanical Stokers, Small Independent Electric Light Equipments, Centrifugal Pumps, and for use with Exhaust or Ventilating Fans, Blowers, etc. Catalogues on request.

ACME ENGINE SIZES FROM ONE HALF TO THIRTY-FIVE H.P.

Engine Model	1	2	3	4	5	6	7	8	9	10
Bore (inches)	2¼	3	3 5/16	3 5/8	4	4 3/16	5	5	6	7
Stroke (inches)	3½	3½	3½	5	5	5	5	7	7	7

Any of the above sizes may be operated at a speed up to 600 R.P.M.

A. ALLAN & SON

494 GREENWICH STREET

NEW YORK

SOLE MANUFACTURERS OF ALLAN BRONZE, ALLAN RED METAL, ALLAN METAL VALVE DISCS, ALLAN BEARING BRONZES

BEARING BRONZE

The Essentail Qualities of a High Grade Bearing Bronze are:

That it will sustain the load without rupture.

That it will make the friction between the bearing and shaft as low as possible.

That it will give the longest possible service, with the smallest possible loss of metal by wear.

That it will require only a minimum amount of lubrication.

That it will not have a tendency to heat rapidly, causing the bearing to hug and tear the shaft.

A bearing alloy with these qualities is the highest standard of efficiency and a guarantee of low maintenance cost.

It is universally conceded that lead-copper-tin alloys possess the essential qualities of a high grade bearing bronze, but owing to the difference in specific gravity and fusing points of these metals, it is impossible to produce by ordinary foundry practice, lead-copper-tin alloys high in lead, without lead sweat or segration.

Our alloys are not made by rule-of-thumb methods, but by the Allan process, the process whereby lead-copper-tin can be mixed into a homogeneous bronze. They are made from the best brands of Virgin metals.

It is impossible to produce a bronze of standard proportions which will be universally satisfactory for all work and conditions. To meet these conditions Allan Bronzes are made in several grades, according to service for which they are specified.

We recommend Allan No. 4 Bronze for crank-pin brasses, piston pin bearings on gas engines, driving boxes and rod brasses on heavy and high-speed locomotives. Allan No. 2 Bronze for thrust bearings on vertical rolls, pinion bearings on plate mills, where high temperature and excessive pressures are to be met.

Write our Engineering Department your service conditions. We give the most liberal guarantee of quality and efficiency.

A. ALLAN & SON

494 GREENWICH STREET

NEW YORK

SOLE MANUFACTURERS OF ALLAN BRONZE, ALLAN RED METAL, ALLAN METAL VALVE DISCS, ALLAN BEARING BRONZES

ALLAN RED METAL

For Bearings, Pistons and Packings

The introduction in locomotive, marine and stationary engine construction of the use of superheaters, and the results of greater efficiency thereby derived, is a noteworthy advancement in modern engineering practice. But with this forward movement arises troublesome details which have to be met and overcome.

One, of no little moment, is the need of a babbitt or antifriction metal to cope with the excessive heat of highly superheated steam. Allan Red Metal will give satisfactory service with steam at 175 pounds pressure and 200° superheat. It was never intended to displace white babbitt metal—but to overcome its shortcomings—to do the work white babbitt metal will fail to do.

Allan Metal faced pistons are recognized by mechanical engineers as the most advanced design in piston construction.

As shaft packing on steam turbines it has proven its efficiency over carbon.

It is a bearing alloy that cannot be melted out of a bearing, even under the most severe service condition, nor will it hug, stick to, scar or cut the pin or shaft.

Allan Metal Globe Valve Discs supersedes the vulcanized disc, due to their lasting qualities.

Allan Red Metal is as great an advancement in the metallurgy of antifriction metal as superheated is to saturated steam. They are both forward movements to greater efficiency in modern engineering practice.

Our Booklet, "The Heart of the Engine—The Seat of Power," is a treatise on piston design and will be mailed free upon request.

MAGNOLIA METAL CO.

NEW YORK
113-115 Bank Street

CHICAGO
Fisher Building

MONTREAL
225 St. Ambroise St.

MAGNOLIA METAL

FAC-SIMILE BAR OF MAGNOLIA METAL

COEFFICIENT OF FRICTION Tests by great governments and eminent mechanical experts all show that Magnolia has the smallest coefficient of friction of any known bearing metal. The United States Government test—when *water* was used as the lubricant—300 lbs. pressure per square inch, 491 R. P. M., showed a frictional coefficient as low as 0.0008. The test by the French Government—710 lbs. pressure per square inch, 6.56 ft. per second—lubricant "black oil," showed coefficient 0.0012.

WEARING QUALITIES Magnolia ran over twenty-three years on log mandrel bearings and was in good condition when plant was permanently shut down. It is the rule rather than the exception for Magnolia lined bearings to run for five and ten years and longer.

HEAVY PRESSURES Thousands have testified that Magnolia is the only metal that will stand the heavy pressure on their bearings: proving superior to and out-wearing bronze and brass in Rolling-mill work, etc. Professor John Goodman, the well known English authority, says of Magnolia—"The higher the pressure that is applied to a Magnolia bearing, the better does the wearing surface become." He tested it up to two tons per square inch.

HIGH SPEED Magnolia is used largely in thousands of wood-working and other plants where both the speed and duty are very severe and is extolled for its lasting and other qualities. It commonly runs in such places from four to fifteen years.

LUBRICATING QUALITIES Magnolia is largely a self lubricating metal. In the *water* test by the U. S. Government Magnolia was run for 5 hours up to 600 lbs. inch pressure—the limit of machine—490 R. P. M., and proved to be 200% superior antifrictionally to a conventional Babbitt of the same formula as Magnolia but not subjected to the same special foundry treatment and 1100% superior to white brass. Magnolia has run six years on shafting bearing without a drop of lubrication and Engineers very often speak of large saving in oil on Magnolia bearings.

GRIT We have great numbers of letters laying particular stress upon the wonderful wearing qualities of Magnolia bearings that are subjected to grit and dust in Cement Mixers, etc. etc.

DETAILS We will gladly send our advertising literature giving full particulars to any one interested.

TAYLOR INSTRUMENT COMPANIES

ROCHESTER, N. Y.

"Where *Tycos* Thermometers Come From"

NEW YORK
Bank of Metropolis Bldg.
31 Union Square

BOSTON
44 High Street

CHICAGO
Heyworth Building
29 E. Madison St.

MANUFACTURERS OF A COMPLETE LINE OF INSTRUMENTS FOR THE INDICATING, RECORDING AND REGULATING OF TEMPERATURE AND PRESSURE.

"*Tycos*" Thermometers for every purpose and application, including the famous H&M "*Tycos*" Type; "*Tycos*" Recording Thermometers in both Self-Contained and Capillary form; "*Tycos*" Index Thermometers, etc., Indicating and Recording any range of Temperature from minus 328°F to 1000°F.

H & M "*Tycos*" Automatic Temperature and Pressure Regulators for processes requiring uniformity of Temperature or pressure conditions.

"*Tycos*" Time Valves, in conjunction with H&M "*Tycos*" Regulators, make it possible to continue a process at a given temperature for a desired period of time, at the expiration of which the steam line is closed off and the exhaust opened, terminating the process.

"*Tycos*" Rotary Switchboards are made for the control of any number of High Temperature Stations, up to and including twenty.

"*Tycos*" Pyrometers—

Base-Metal from 200°F to 1800°F.
Rare-Metal from 1000°F to 2500°F.

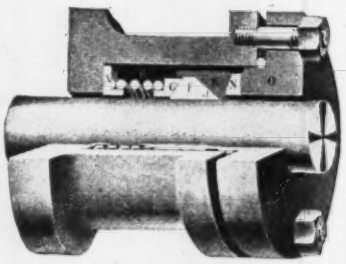
Foster "*Tycos*" Fixed Focus Pyrometer is the most dependable portable instrument.

FERY RADIATION PYROMETER has no top limit. It is extremely sensitive and in action is almost instantaneous.

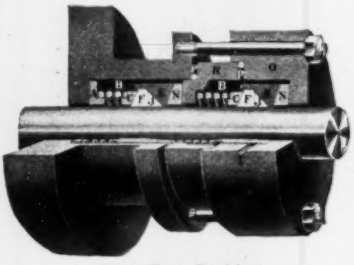
C. LEE COOK MANUFACTURING CO.

LOUISVILLE, KY., U. S. A.

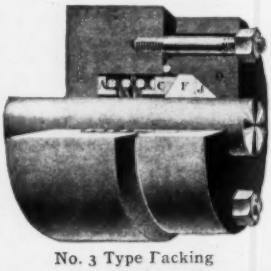
COOK'S METALLIC PACKING FOR STEAM, GAS AND AIR, ON POWER ENGINES OF EVERY DESCRIPTION; ESPECIALLY ADAPTED TO EXTRA HEAVY DUTY SERVICE ON REVERSING BLOOM MILL ENGINES, BLOWING ENGINES, ROLLING MILL ENGINES, GAS ENGINES, MARINE ENGINES, LOCOMOTIVES, AND ENGINES OPERATING UNDER VERY HIGH STEAM PRESSURE AND SUPERHEAT.



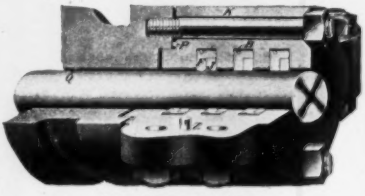
No. 1 Type Packing



No. 2 Type Packing



No. 3 Type Packing



No. 6 Type Packing

SINGLE TYPE PISTON ROD PACKING

Is familiar to every leading engine builder in the United States. We have had satisfactory and agreeable business relations with them all.

It is simple, and economical as compared with other types of Metallic Packing, and has special merit not afforded by others. An examination of its construction will be proof sufficient that it is *steam tight*, will not cut, or score the rod, and operates with minimum friction.

DOUBLE TYPE PISTON ROD PACKING

A trying difficulty before the successful operation of Metallic Packing, is the elimination of condensation. We accomplish this by placing two sets of Metallic Packing together, as seen in the cut. The upper, or main set, holds the pressure while the lower set arrests the water and conveys it to the threaded opening "T" of the lower Gland "O." A valve and a drain pipe is attached to this, and after the engine is hot, and condensation reduced to a minimum, the valve may be closed, thus putting into action two sets of packing, operating as one. Result: DOUBLE DURABILITY.

CORLISS VALVE STEM PACKING

The cut delineates how simple is this packing's design. It is so near frictionless that there is no appreciable difference offered to the turning of the stem when the packing is on or off. Hence, when this packing is applied, the Valve Gear operates under a uniform condition, and averts the need of continual adjustment of dash-pots. For high vacuum service, we put two sets of this packing together, as illustrated in our Double Piston Rod Packing, and inject a steam seal under pressure through the opening which forms the drain in the former case. This hermetically seals the vacuum.

SPLIT PISTON ROD PACKING

The cut delineates our outside type of packing cage, but we make it in any design that requirements or preference demands. Hence we can completely insert it in the stuffing box, using the fiber gland to hold it in place, or we can partly insert it with its outer end in the shape of a flange drilled to receive the studs, and thereby serve as the gland. We make packing rings for this type of packing in over six designs, all depending upon the preference of the engineer and the requirements of the service. A striking innovation in split packings is our copper gasket that forms a joint between the stuffing box and the packing case.

THE B. F. GOODRICH COMPANY

AKRON, OHIO

Offices in all principal cities

MANUFACTURERS OF MECHANICAL RUBBER GOODS, TIRES, ETC.

HOSE

WATER HOSE covers a wide range of usage, making it quite out of the question to advance any specific recommendations as to quality.

"WHITE ANCHOR" and "AKRON"—special grades for unusual conditions of service.

"TRITON," "CASCADE," "DELUGE,"—regular grades for all general purposes. Braided fabric water hose—in either smooth or corrugated cover.

STEAM HOSE must be heavily constructed to stand the pressure, and the inner lining must be so compounded as to resist the action of steam under varying temperatures.

"GOODRICH"—for high pressure. This is truly a long-life hose.

Special coverings for steam hose: Red Painted woven cotton cover, Woven Marlin Cover, Asbestos Wire-Wrapped cover.

PNEUMATIC HOSE wrapped duck—50′ length style:

"GOODRICH"—the highest quality for the hardest service.

"AKRON"—the standard hose, for all general purposes.

Wire wrapped pneumatic tool hose.

BRAIDED-FABRIC PNEUMATIC HOSE—smooth or corrugated.

AIR DRILL HOSE is heavily constructed throughout with a layer of canvas on the outside as a protection against cuts and abrasions.

"GOODRICH"—exceptionally high quality, unequalled for wear.

"QUARRY"—our standard grade and biggest seller.

BOILER WASHOUT HOSE is made in extra heavy weight to withstand the rough service it encounters. We advocate our heavy "Boiler Washout Hose" for turbine tube cleaner work. Made in two grades, "Goodrich" and "Akron."

SUCTION HOSE is made in a variety of grades to suit any purpose, either smooth or rough bore style.

DREDGING SLEEVES, OIL SUCTION HOSE, OIL WELL DRILLERS' HOSE, OIL CONDUCTING HOSE, GASOLINE HOSE, SAND BLAST HOSE, COKE HOSE, MARINE DECK HOSE, all especially adapted to the purposes for which they are made.

PACKING

RED SHEET PACKING—an excellent product, in two grades.

RED SHEET BRASS WIRE INSERTED in the same grades.

DIAPHRAGM AND CLOTH INSERTION: Packing highly recommended for their proper uses.

SUPER HEAT PACKING, a combination of rubber and asbestos, especially adapted for high pressures.

RED TUBULAR GASKET PACKING, SPIRAL SQUARE DUCK PACKING, ROUND AND SQUARE DUCK PACKING, SQUARE RUBBER BACK, ROUND PISTON PACKING, AND PURE GUM STRIPS all made to supply the demand for these various kinds.

RUBBER GASKETS

All grades and shapes. No matter what your requirements may be, we can supply them.

RUBBER PUMP VALVES

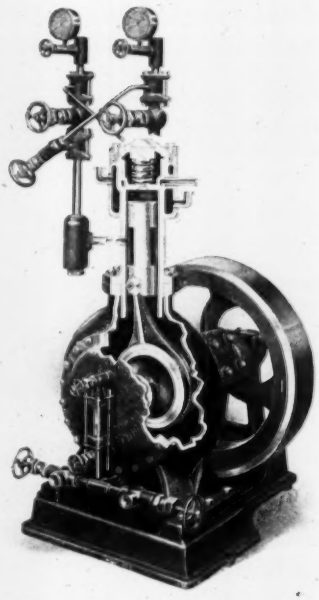
There is no class of our product which we take greater pride in stamping with the GOODRICH trade mark. Our list of grades is complete; we are always glad to give special attention to unusual conditions.

Made in grey or red rubber.

BRUNSWICK REFRIGERATING CO.

NEW BRUNSWICK, N. J., U. S. A.

REFRIGERATING AND ICE MAKING MACHINERY
For Private Residences and Estates.
MARINE REFRIGERATING AND ICE MAKING PLANTS.
COMPLETE PLANTS INSTALLED FOR COMMERCIAL REFRIGERATION OF ANY KIND



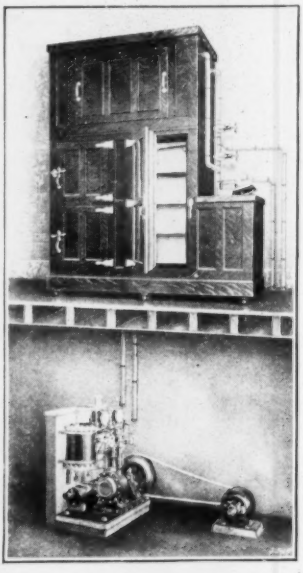
CONSTRUCTION

The "BRUNSWICK" is constructed throughout for maximum strength, efficiency, and durability. For private residence work the "BRUNSWICK" is acknowledged to be the most successful type on account of these features and its simplicity.

The COMPRESSOR is fool proof. Note the eccentric drive; the double set of piston rings; the safety relief valve inside of the discharge valve; the fact that the discharge valve is the full diameter of the cylinder. There is not a bolt or a nut inside of the crank case of the machine.

THE "BRUNSWICK" SYSTEM

"BRUNSWICK" experience has improved not only the compressor, but the whole system from the automatic expansion valve which is used on the smaller units through the expansion side of the plant, through the compressor, condenser, and back to the ammonia receiver. Nothing but the very best and strongest material is used. The fact that there are nearly 1,200 "BRUNSWICK" plants in operation today of 12 tons refrigerating capacity and less, 1,000 of which are under 6 tons capacity, is the best testimony that can be given regarding design, material and workmanship.



APPLICATION

RESIDENCES	Confectioners
STEAMSHIPS	Dairies
Clubs and Cafes	Ice Cream Makers
Office Buildings (ice water)	Butchers
Hotels	Etc., Etc., Etc.

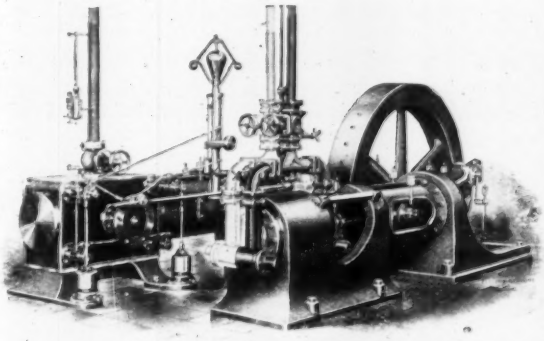
Send for list of residence installations. Send for list of steamships equipped with "BRUNSWICK" plants, or for general list of installations of all kinds.

The "BRUNSWICK" motto is not "Build the cheapest machine," but "Build the best." Our specialty is the small unit.

THE HUETTEMAN & CRAMER CO.

DETROIT, MICH.

REFRIGERATING AND ICE MAKING MACHINERY



The "Safety" Ammonia Compressor

FEATURES OF ADVANTAGE OF THE "SAFETY" REFRIGERATING MACHINE

This machine is designed to minimize the possibility of wreck or damage caused by a valve part or by liquid becoming imprisoned between cylinder and piston.

Due to the peculiar location of the compressor suction and discharge valves it is impossible for any valve part in case of breakage to enter the cylinder, and any shot of liquid that may come through the suction pipe will be forced out through the discharge valves, before the piston reaches the end of its stroke.

The machine is designed along the most improved and up-to-date lines, being of heavy duty construction throughout, and on account of being built horizontal it can be readily looked after and adjusted; also because of being made in sections, which in addition eliminates undue strains that exist in all large castings, it will permit of being installed in close quarters and in out of the way locations.

All working parts are provided with large wearing surfaces, every means of adjustment is provided, all these being readily accessible, and improved oiling devices are fitted to all wearing surfaces.

Because of its simplicity, accessibility and ready adjustment, it can be placed in charge of any average engineer with best results.

These machines are built for direct connection with engine or to be belt driven.

CAPACITIES IN TONS OF REFRIGERATION SIZES APPROXIMATE SPEEDS AND POWER REQUIRED

Tons Cap..	6½	8	9	11½	15	25	30	40	45	50	60	65	80	90	100	115	145	160
Bore.....	5½	6¼	6	7	8	9	10	11	11½	12	13	13½	14	15	16	17	18	19
Stroke....	12	12	14	14	16	18	20	22	22	24	26	26	30	30	32	32	36	36
R.P.M....	90	90	85	85	80	80	75	75	75	70	70	70	65	65	60	60	60	60
Appr. H.P..	10	14	15	18	25	40	45	60	65	75	90	100	120	135	150	175	220	240

ALPHABETICAL INDEX TO CONDENSED CATALOGUES OF POWER PLANT EQUIPMENT

Allan, A. & Son, New York 78, 79

Badger, E. B. & Sons Co., Boston, Mass 66
Blake & Knowles Steam Pump Works, New York 56
Bowser, S. F. & Co., Fort Wayne, Ind 75
Brownell Company, The, Dayton, Ohio 48, 49
Brunswick Refrigerating Co., New Brunswick, N. J 84

Cook, C. Lee, Manufacturing Co., Louisville, Ky 82
Custodis, Alphons, Chimney Construction Co. New York 51

Darling Pump & Mfg. Co., Ltd., Williamsport, Pa 67

Elyria Gas Power Co., Elyria, Ohio 43

Foskett & Bishop Co., New Haven, Conn 64

Gas Machinery Co., Cleveland, Ohio 53
Goodrich, The B. F. Co., Akron, Ohio 83

Heer Engine Co., Portsmouth, Ohio 44
Huetteman & Cramer Co., Detroit, Mich 85
Hunt, C. W., Company, West New Brighton, N. Y 52

Kennicott Company, The, Chicago Heights, Ill 58

Magnolia Metal Co., New York 80
Model Stoker Company, Dayton, Ohio 54
Mohr, John & Sons, Chicago, Ill 50

National Pipe Bending Co., New Haven, Conn 60, 61
Neemes Bros., Troy, N. Y 55

Ohio Brass Co., Mansfield, Ohio 65

Pittsburgh Gage & Supply Co., Pittsburgh, Pa 76
Pittsburgh Valve, Foundry & Construction Co., Pittsburgh, Pa 68, 69, 70, 71
Pratt & Cady Company, Hartford, Conn 72, 73

St. Marys Machine Co., St. Marys, Ohio 45
Sterling Machine Co., Norwich, Conn 77
Strong, Carlisle & Hammond Co., Cleveland, Ohio 62, 63

Taylor Instrument Companies, Rochester, N. Y 81

Walworth Manufacturing Co., Boston, Mass 74
Waters Governor Company, Boston, Mass 59
Wisconsin Engine Co., Corliss, Wis 46, 47
Worthington, Henry R., New York 57

ALPHABETICAL INDEX TO DISPLAY ADVERTISEMENTS AND DIRECTORY CARDS

	Page
Allen Manufacturing Co., Inc.	25
Alliance Machine Co.	21, 37
Allis-Chalmers Co.	15, 29, 34, 39
Almy Water Tube Boiler Co.	27
Aluminum Co. of America	42
American Balance Valve Co.	30
American Engine Co.	20, 27
American Injector Co.	12, 30
American Pulley Co.	35
American Steam Gauge & Valve Mfg. Co.	30
American Steam Pump Co.	23, 34
Arnold Co., The	24
Ashton Valve Co.	30
Auburn Ball Bearing Co.	42
Babcock & Wilcox Co.	19, 27
Baldwin, Bert L.	24
Ball Engine Co.	11, 27
Best, W. N.	30
Bristol Co.	19, 31
Brown, A. & F. Co., The	20, 35
Brown Hoisting Mchy. Co.	37
Buckeye Engine Co.	11, 27
Builders Iron Foundry	23, 42
Butterfield & Co.	25
Caldwell & Son Co., H. W.	37
Carborundum Co.	25
Carlyle Johnson Machine Co., The	36
Carpenter Tap & Die Co., J. M.	22
Chapman Valve Mfg. Co.	31
Chicago Pneumatic Tool Co.	40
Clyde Iron Works	21, 37
Crosby Steam Gage & Valve Co.	31
Dallett Co., Thos. H.	31
Davidson Co., M. T.	34
Dean, F. W., Inc.	24
De La Vergne Machine Co.	29
Dodge Manufacturing Co.	36
Eastern Machinery Co.	37
Electrical Testing Laboratories	24
Engineer Co., The	13, 31
Engineering Schools & Colleges	24
Erie City Iron Works	28
Falls Clutch & Mchy. Co.	20, 36
Fellows Gear Shaper Co.	25
Flexible Steel Lacing Co.	36
Garvin Machine Co.	25
General Electric Co.	39
Goodrich Co., B. F.	17, 37
Goulds Mfg. Co.	23, 35
Harrisburg Foundry & Machine Works	28
Heald Machine Co.	25
Hewes & Phillips Iron Works	14, 28
Hill Clutch Co.	36
Hills-McCanna Co.	31
Holyoke Machine Co.	35
Homestead Valve Mfg. Co.	31
Hooven-Owens-Rentschler Co.	13, 28
Hughson Steam Specialty Co.	31
Ingersoll-Rand Co.	7, 26, 32, 40
Jeffrey Mfg. Co.	17, 37
Jenkins Bros.	19, 32
Jolly, J. & W., Inc.	35
Jones & Lamson Machine Co.	2, 3, 26
Keasbey Co., Robt. A.	32
Keeler Co., E.	19, 28
Kennedy Valve Mfg. Co.	18, 32
King Machine Tool Co.	26
Kingsford Fdy. & Mch. Wks.	18, 28
Le Blond Machine Tool Co., R. K.	26
Lidgerwood Mfg. Co.	38
Link-Belt Co.	38
Ludlow Valve Mfg. Co.	32
Lunkenheimer Co., The	15, 32
Mackintosh Hemphill & Co.	41
Main, Chas. T.	24
Manning, Maxwell & Moore	22, 26
Manufacturing Equip. & Engrg. Co.	22, 26
Mead-Morrison Mfg. Co.	6, 38
Mesta Machine Co.	9, 28
Mietz Iron Foundry & Machine Works, August	29
Monarch Valve & Mfg. Co.	32
Morehead Mfg. Co.	32
Morgan Engineering Co.	38
Morris Machine Works	23, 35
Mumford Molding Mch. Co.	40
Murphy Iron Works	12, 33
National Meter Co.	10, 30
Nelson Valve Co.	5, 33
New Process Raw Hide Co.	14, 26
New York University School of Applied Science	24
Oneida Steel Pulley Co	35

	Page
Paxson Co., J. W.	40
Peterson, J. Wm.	24
Pickering Governor Co.	33
Polytechnic Institute of Brooklyn	24
Power Plant Specialty Co.	33
Power Specialty Co.	33
Professional Cards	24
Providence Engineering Works	28
Reedy Co., H. J.	20, 38
Rensselaer Polytechnic Institute	24
Ridgway Dynamo & Engine Co.	10, 29
Robb Engineering Co., Ltd.	18, 29
Roberts Filter Mfg. Co., Inc.	42
Robins Conveying Belt Co.	38
Rockwood Manufacturing Co.	36
Roebling's Sons Co., John A.	16, 38
Roots Co., P. H. & F. M.	41
Ruggles-Coles Engineering Co.	41
Sandusky Fdy & Mch. Co.	8
Scaife & Sons Co., Wm. B.	33
Schutte & Koerting Co.	33
Shaw Electric Crane Co.	38
Sherwood Manufacturing Co.	33
Smith Gas Power Co., The	30
Standard Roller Bearing Co.	22, 42
Sturtevant Co., B. F.	41
Tagliabue Mfg. Co., C. J.	34
Texas Co., The	34
Toledo Bridge & Crane Co.	39
Tufts College	24
Union Drawn Steel Co.	42
United Engineering & Foundry Co.	9, 41
Vilter Manufacturing Co., The	29
Wagner Electric Mfg. Co.	39
Waltham Machine Works	26
Warner & Swasey Co.	1, 27
Webster Mfg. Co., The	39
Wells Brothers Co.	27
Westinghouse Electric & Mfg. Co.	4, 39
Westinghouse Machine Co.	29
Wheeler Condenser & Engrg. Co.	34
Wheeler Mfg. Co., C. H.	34
Whiting Foundry Equipment Co.	21, 40
Wood's Sons Co., T. B.	36
Woods Machine Co., S. A.	1, 42
Yale & Towne Mfg Co.	16, 39